AMERICAN MACHINIST

A JOURNAL FOR MACHINISTS, ENGINEERS, FOUNDERS, BOILER MAKERS, PATTERN MAKERS AND BLACKSMITHS.

VOL. 3, No. 9. WEEKLY. | NEW YORK, FEBRUARY 28, 1880. | $3.00 per Annum. SINGLE COPIES, 6 CENTS.

Brotherhood's Rice Pounding Pestle and Mortar Machine.

In the process of cleaning rice it has been found necessary, after hulling, to put the grain through another process, to remove the little shucks that still adhere to the kernels. The machine, shown in the accompanying engraving, was designed for this purpose, and has been introduced into some of the principal rice-producing regions of the South, where it is said to be working very successfully. It is intended for use in mills, and on large plantations, and is used after the usual hulling stones. It can be run by horse, water or steam power, and will clean 25 bushels per mortar per day. The capacity of the mortar is 5 bushels, and can be run with one-horse power.

The construction of the machine will be understood from the engraving which shows a general elevation of a two-mortar machine.

The pestle is attached to a lifting board, which passes between two rollers at the top of the machine. One of these (the lifting roller) is of peculiar construction, having 28 inches of its circumference turned with uniform radius; the balance of the circumference being contracted, spirally, towards the center.

This principle will be readily understood by referring to the illustration, page 2, which shows the points of lifting and falling. Pressure is imposed upon the lifting board through an idler roller, hung in eccentric boxes, and adjusted to the board by a tightening screw and hand wheel, as shown.

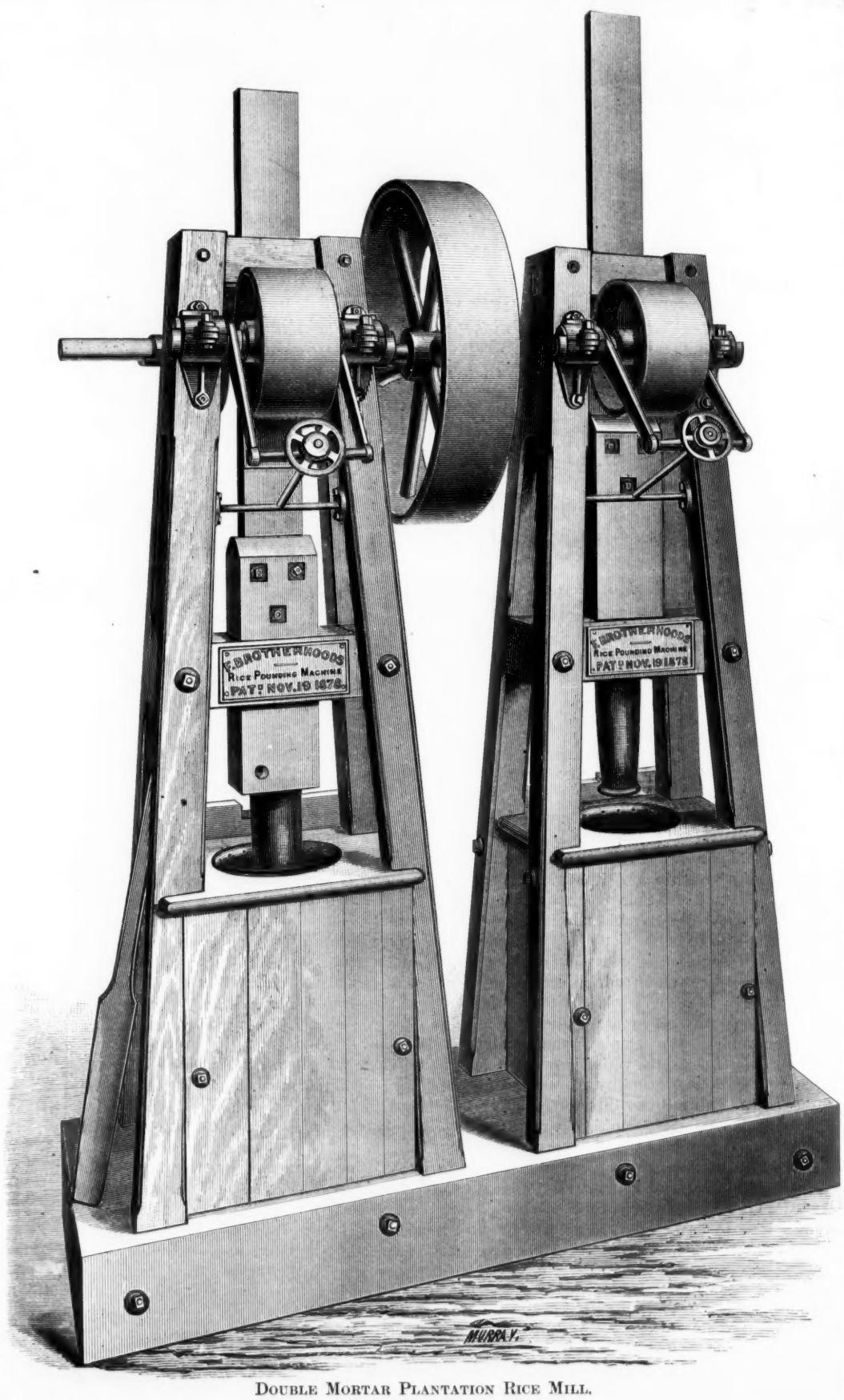
In operation, the lifting roller, as it revolves, brings the turned portion of its circumference in contact with the lifting board, thereby raising the pestle through a space of 28 inches, when the contracted portion of the lifting roller comes opposite the board, and the pestle is free to fall, to be again taken up by the largest diameter of the roller.

To prevent the pestle being raised higher than will bring the point of pestle boot 4 inches above the top of mortar, the lifting board is reduced in thickness at its lower end, so that at this point the rollers cannot touch the board.

When desired to empty and recharge the mortar the pestle is caught up on a wooden lever, and raised so that the reduced portion of the lifting board comes between the rollers; the pestle is ,then securely hung up by a wooden pin on the cross guide bar above the mortar.

The advantage of the machine is its great simplicity; it does not require a specially-constructed building, is easily driven, and, owing to the uniform drop of the pestle, will yield a superior turn out; it will pound very soft rice, which the old style pestle cannot, and makes a very much smaller percentage of broken grains. It also has the advantage of being almost noiseless in operation, and, where more than one pestle is in use, should at any time a lifting board become disabled, it can be taken out and a new one inserted in a few minutes, and this without stopping the others. In the old mills, when a lifter breaks the pestle must be hung up or the whole line stopped to replace it.

The number of pestles driven by one shaft is not limited, the inventor having constructed batteries having 15 pestles on the one shaft, and when more than one pestle is worked from the same shaft, the whole of the pestles are not lifted simultaneously, but one after the other, so as to relieve the shaft from an undue strain. Speed of pulley should be from 48 to 51 revolutions. It is a well-known fact that the pestle and mortar has for ages proved the most successful machine for cleaning rice, and this improved method of lifting the pestle greatly increases its advantage and adaptability to country and city mills.



DOUBLE MORTAR PLANTATION RICE MILL.

Further particulars may be procured by addressing Wm. Cooke, General agent, No. 6 Cortlandt street, N. Y., or the Patentee, Charleston, S. C.

Extracts from Chordal's Letters.

Mr. Editor:

* * * * Thankful should be the man who don't have anything to do with cast gearing. On the principle that it is wise to shove all the cares and troubles of this world on to some one else, no well regulated machine-shop owner should own any gear patterns. From the birth of the pattern to the collection of the insurance on it, it is a continuous source of profanity. To start on: the drawing it was made from was not right; the pattern wasn't like the drawing, and the castings aint like the pattern, and the pattern changes with every wind that blows. The seven ages of man don't work the changes that we find time makes in gear patterns. Seven years is said to change and replace the material of the human body. Less years of daily use of a gear-pattern will do the same thing. Metal-patterns are the proper thing, of course, but their general use would not be profitable. As long as mill gearing is used, so long will wooden patterns be used. No one ever heard of a gear pattern being thrown away so long as, by any sort of repairs, a casting could be made from it. Many of the oldest shops in the country, shops which cling to the old things, and dislike innovation, have bravely thrown away full sets of pulley patterns, and made new ones of better form; but no one ever heard of the plan being followed with gearing. There is competition in the pulley trade, and a pulley can be bought for a stated price. This compelled even the unwilling to get up pulley patterns of proper proportion, in order to get rid of the ridiculous weight we used to pay for by the pound. Not so with gears however. If a man has a lot of gear patterns a thousand years old, with the teeth the wrong shape, and the diameter wrong for the number of teeth, and the rim sharp cornered, and the arms set the wrong way, he gets orders for castings from them and will continue to do so.

* * * * In a lot of old gear patterns you will find that no one rule has been followed in their construction. The fancy of the pattern-maker governed all. You find two wheels running together, made in the same shop. One has a braced oval arm, the other has a flat spoke. One has a rim whose thickness is twice the pitch, the other has one a third as thick. One has rounded lines and washed corners and fillets; the other has all the internal and external sharpness that can be produced in iron. One has a deeper tooth than the other; the pitch is not just the same in both, and the same law had nothing to do with shaping their teeth.

* * * * In the pattern list of G——, I find a seventeen tooth wheel, one inch pitch, one-and-a-half inch face, five and three-eighths diameter, and another seventeen tooth wheel, with the same pitch, but a different face, five-and-a-half in diameter. Two different pattern-makers made these patterns and the probability is that neither is really an inch pitch. A worse case than this is in the list of O., L. & D. One fifteen tooth pinion has a diameter of four and eighty-seven hundredths, while another, with different face but listed as same pitch has a diameter of four and sixty-two hundredths. Such things occur all through gear pattern lists.

* * * * An eighteen tooth pinion with one inch pitch shows five different diameters on six different lists.

A twenty-four tooth pinion, one inch pitch, shows up diameters as follows: W., C. & L's list 7.68 inches; G—— 's list 7.75; O., L. & D's list 7.37. Sixty teeth one inch pitch shows: W.,C. & L. 19.2 inches; L. & B. 19 inches. This is close enough for work which can use such gears, for the average cast wheel is about that much out of round anyhow.

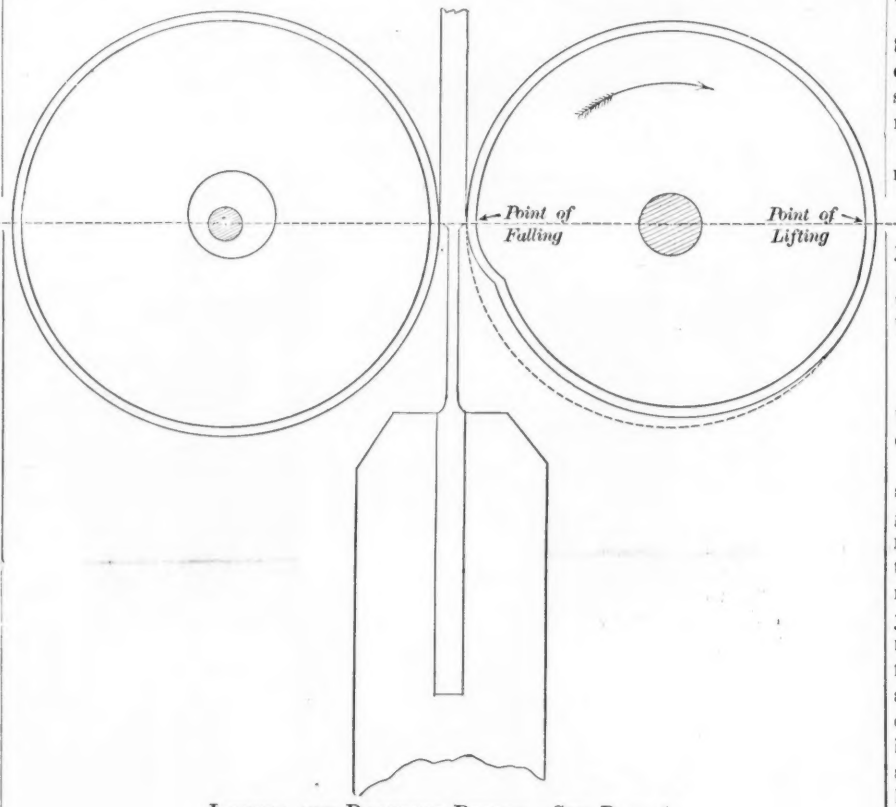
* * * * Gear patterns, bad as they are, cost a great deal of money. The gear-moulding machines have filled a void, but will never take the place of sets of patterns. The same old way of making gear patterns in wood is the way to-day, and it seems to me that there is money in some plan by which a good pattern might be duplicated in light material.

* * * * It goes against the grain of a man who has a foundry, to be buying castings from another foundry, and I believe that the matter of providing all foundries with well-made standard gear patterns would meet with proper returns. The scheme might be as follows: Say, a party with the proper skill, push, and capital, starts a place anywhere in the country. He makes perfect patterns for full sets of such staple gears, such as bolting gears, stone pinions, etc. These patterns are not to be made in wood by the old expensive process, but in plaster of Paris, by the inexpensive and perfect process invented by Mr. Jackson, some years ago. When the plaster pattern is done it is a machine made, machine divided, and machine cut pattern, and its expense under a systematic plan of procedure would be trifling.

Castings of rims only are to be made from these plaster patterns by specially skilled workmen. These rim castings are to be treated in a gear cutter, using an emery wheel on the English plan, and when done represent an article which can be sold at a price far below the ordinary cost of wooden patterns, incorrect in every detail, and liable to continuous decay.

The same procedure would permit of exterior strippers accompanying the patterns, and this would give us something good in the way of cast gearing. No draft, and no rappage. Foundry men would buy patterns from such a concern, and each special order would leave an original for duplication. A price list based on the number of teeth, pitch, and face, might be made, and by the exercise of a certain amount of grit, a proper proportion might be maintained between the pitch and face. Judicious selections and groupings might be made, which would allow country shops to start fair with an inexpensive set of enduring patterns which would allow them to accomplish two-thirds of their desires in the gear line, while the other third might be made to await the receipt of patterns by first freight. There is only one element requisite to the success of such a scheme, viz: that a good pattern in iron, made by the system proposed, shall be laid down at a cost not to exceed the cost of good home-made patterns.

* * * * If there is any one thing about the machine business which calls for pluck it is the declining of some order which might be immediately filled at an immediate profit, but which, cool judgment suggests, will do harm in the future. Some man comes along and orders a long line shaft of uniform diameter. Judgment suggests, at once, that the shaft is entirely wrong, and that it will cause trouble. The party don't want the substitute you suggest. He wants this shaft. There is money in the job, and you want the work. Will you do the job, be it right or wrong, or will you let it pass by you? Which plan is "business"? Some ignorant engineer brings you a drawing for a six-inch forged crank shaft with the crank pin four inches. You modestly suggest that this makes a four-inch shaft of it, and that one of the dimensions is wrong. He points out a dozen cases of shafts with end cranks in which the pin bears the above proportion to the shaft, and facetiously asks if you would make a crank pin as large as a shaft. Now, the success of this crank is not your concern, and you may go ahead and do it on that understanding with yourself, and even with your customer, but you will find, Mr. Editor, that the world holds you responsible for the failure of everything which goes through your door. If jobs of this character are a success, there is a man on hand to assume the honors; but, if a failure occurs, the same man is on hand to throw the blame from himself towards yourself. With all the respect in the world for that useful class of men who write "engineer" after their names, I really think they have special advantages, and know as well as any other class of men in the world how to load responsibility on to "construction" if the results are bad.



LIFTING AND DROPPING DEVICE.—SEE PAGE 1.

* * * * Unless a mechanical engineer possesses considerable personal force, he is liable to be in hot water half the time. The civil engineer is generally employed with confidence. Railroad directors say to a C. E.: "Do this work. Here are the terminal points. You are skilled. We know nothing. We employ your judgment." This C. E. is the veriest coward if he tries to shirk responsibility for acts entirely his own. No railroad director reduces the size of his engineer's bridge parts to satisfy a fancy; nor does he reduce the slope of cuttings, or change a proposed gradient, or dictate the angle of a curve. But when the anxious man approaches the mechanical engineer to have means shaped to produce results, he hampers him with the oddest and most ignorant fancies. He dictates the dimensions of elements, and often makes it necessary for his engineer to quit work and devote himself to the education of his patron in the general and special laws of physics. There is no half way ground for a mechanical engineer to take. He must be an instrument in the hands of another power, and do just what he is paid for, or he must act firmly by the rule of "doing things my way or not doing them at all."

A man acting on the latter plan will make sad failures, but he can have no doubt of where the blame lies. He can lay bold claim to his successes. If he has chosen the wrong vocation, he will fail entirely, and will be compelled to withdraw to other fields of usefulness, where the same general principles of action will make his life a success in the end. If he is successful in his original field, there can be no doubt of his success, and he will not have to constantly combat the onus attaching to the errors of others. Self-reliance is not to be confused with conceit. Conceit is an "external emotion". Self-reliance is neither external nor an emotion. The engineer who cultivates and makes tenable his ground, and then insists on standing on it, need seldom be confused with one who leans entirely on the suggestions of others.

* * * * From cranky engineers back to engine crank shafts: If you have a set of patterns, for, say, a twelve by twenty engine, and have built a hundred successful engines from the patterns, all well and good. Some customer comes along and wants a fourteen by twenty. You want his order, and you want to make money. You know that the proper thing to do is to get up proper patterns for a fourteen by twenty engine, but a narrow view of things drives you into making the cylinder pattern only and using the other parts of the twelve by twenty. A good builder should not tremble when he does such a thing, for he ought not to do such a thing. If such a deed is once done it will grow into a habit. Numbers of fourteen by twenty engines will be sold, and some fine day a sixteen by twenty cylinder will be put on the same belt. Just as well as not. You will some day forget that these patterns were ever made for a twelve by twenty, and that you ever built a properly proportioned engine.

There was once a concern engaged in building machine tools. A certain twenty-four inch swing lathe was tip top. It was raised to twenty-six, then to twenty-eight, then to thirty. Then bad reports came in. The thirty inch lathe had no power. Larger cones were made, then a larger spindle, then a heavier head-stock, then heavier feed gearing, some change of some kind every time; a new lathe was built, and, of course, every lathe sent out in the meantime from these butchered patterns was wrong and damaging to the builder.

The plan was carried through planers and slotters and, in course of time, customers found that small tools would be wrongly large, and large tools would be wrongly small, and under no circumstances would any tool be rightly correct. This led to decay and death, the natural result of straying from a path, hard, indeed, to follow, but leading direct to permanent success. A premeditated system in making a pattern do double duty will produce perfect results, but make-shifts in manufactured products lead downward always.

* * * * Very respectfully,

CHORDAL.

Business Maxims.

A prominent merchant has compiled the following maxims from his own inquiry and experience:

1. Choose the kind of business you understand.
2. Capital is positively required in business, even if you have real estate outside and credit ever so good.
3. One kind of business is as much as a man can manage successfully. Investments on the outside do not generally pay, especially if you require the money in your business.
4. Buy cautiously and just what you want, and do not be pursuaded to purchase what you do not need; if you do, you will soon want what you can't buy.
5. Insure your stock; insure your store; insure your dwelling, if you have one. If the rate is high it is only because the risk is great, and of course you should not take the risk yourself. A business that will not pay for insuring will not justify running.
6. Sell to good, responsible parties only. Sell on a specified time, and when your money is due demand it; do not let the account stand without note or interest for an indefinite period.
7. Sell at a reasonable profit and never misrepresent to effect a sale.
8. Live within your income; keep your business to yourself; have patience, and you will succeed.
9. Competition is the life of trade, but in trying to run your competitor out of business, be careful you do not run yourself out.

The following extract from a private letter to a friend of ours who has just started an office for engineering, is somewhat pithy:—

* * * * I hope you may engineer it so successfully that you will always have up a good head of the steam that makes even the most mechanical wave move smoothly. May the firm in which you are, or may be a section, never burst nor burn out its boilers of which you are whom. May you never break a bolt, nor bolt to break; may your fly-wheel never fly off; may your salt-feed always be sweet, and your steam-chest be sound. May your cylinder be able to digest all that is put into it, and all your connections work as smooth as oil. Don't get your bearings heated, but keep your weather-blower open so as to keep down the temperature. In other words, may you sail through the smoothest sea of life at maximum speed, compatible with maximum safety and minimum cost. Now let her go ahead! * * * *

Printing Books for the Blind.

The printing press manufactured expressly for the Perkins Institution for the Blind, at South Boston, and named the Howe Memorial Press, in honor of the late Dr. Howe, is found to do its work with great rapidity and perfection. Embossed books for the blind may now be printed at a comparatively small expense, and it is hoped to raise a fund to keep the press vigorously and continuously at work on new books for those who are obliged to read with their fingers.

What Puzzled the Millers.

The *Minneapolis Tribune* relates an amusing incident that happened in the Palisade Mill of that city Jan. 1. The proprietors went to the expense of purchasing a new water wheel, with which to propel the machinery of the Palisade. They reluctantly shut the mill down for a couple of weeks for the purpose of putting this new wheel in, feeling satisfied that the increased power obtained from it would more than repay them for the loss of time. Without stopping to consider the matter of rights and lefts, as applied to water-wheels, the work progressed until, on New Year's morning, it was complete, and, with a great sigh of relief, they

prepared for business, and turned on the water. Imagine their consternation when all the machinery of the mill began to revolve —backwards! Every thing moved in just the opposite direction from what it had ever done before, or was intended to do. The stones turned backward, the elevators ran downward, instead of upward, and—well, the proprietors thought New Year's might have a bad effect on them, and turned the mill or themselves wrong side up The partners, after careful examination, assured each other that none of them were standing on their heads! Then they strolled out upon the platform and took a look at the mill building That was right side up! But the machinery persisted in running the wrong way, from basement to attic, and threatened to reverse the natural order of things by converting flour into wheat. They at first thought of going to the lunatic asylum in a body; but, fortunately, their millwright was suddenly struck with an idea! They shut the gates, he took a squint at the new wheel, and the mystery was explained! It was a "left hand" wheel, and had been thoughtlessly set as a right.

Letters from Practical Men.

PINCHING WORKMEN.

Editor American Machinist:

Chordal is a little too sure about proprietors' care and thought as to the comfort and well-being of their men.

Men may save money and be independent, but let them buy property and their independence is gone. At least this is the case in some small manufacturing towns. John serves his time, knocks around eight or ten years, and finds himself in a good place, with a little money. When John can do better his employer will do better by him. The thoughtful employer, wanting John for a life institution, advises him to buy a house and, by running in debt a little, which he can easily pay, have a home of his own. John swallows the bait, buys and pays. Hard times come and a cut down. After awhile better times come and everything rises. John asks for more pay; can get it elsewhere; is refused by thoughtful owner; is tied down and can't leave. Has a house he can't sell nor rent. Must sacrifice part of fifteen years saving or take what shop-owner offers him. Be saving, but buy no property in a country town.

JOHN.

LAYING OUT CORE BOXES.

Editor American Machinist:

I send you a pair of core boxes illustrating a handy "wrinkle" which is not in use among pattern makers in this vicinity, and, perhaps, is new to the craft in general.

Before cutting out a core box the outline must be transferred to the blocks, directly to one and in reverse to the other, a nice thing to do well with dividers and pencil.

Referring to the accompanying engraving, I will describe the process of laying out a core box. Cut the desired shape (represented by *D*, Fig 1,) from a piece of cardboard, in the absence of which thick writing-paper will do very well. Then place it between the blocks with a piece of impression paper, (to be bought of any stationer) on each side of it. A firm pressure in the vise will now give an imprint on each block, right on one and left or reverse on the other. The imprint is clear as anything that can be drawn with a pencil.

The whole operation only occupies about one-quarter of the time required by the ordinary practice of laying out and transferring with the dividers, besides being more accurate. This process will be readily understood by an inspection of Fig. 2, where *AA*, represent the blocks, the tinted portion the impression paper with the impression of the core in the center.

The impression paper should be kept in a book in order that it may be clean, free from wrinkles, and ready for use at a moment's notice.

This impresson paper is very handy in a pattern shop, for transferring any outline from a drawing to the wood. As it is placed under the drawing it marks the back of the paper only. The lines may be accurately and clearly traced with a small, smooth point.

GEORGE B. GRANT,
100 Beverly St., Boston.

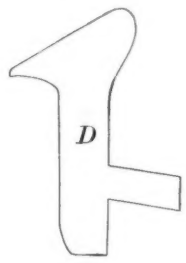


FIG. 1.

GEARING DIRECTLY TO A CRANK-SHAFT.

Editor American Machinist:

DEAR SIR. — Mr. Watson's article on "Pounding in Steam Engines," in your issue dated Feb. 14th inst., fits my own case so closely—in so far as being "unfortunate" in getting hold of a "trap to run"— that I would, with your permission, give the readers of the MACHINIST the benefit of my experience. I assumed the duties of engineer in a large leather factory in an adjacent town, recently. My predecessor held the position thirty-five years, so that it will be readily seen that there was considerable jealousy—not to say prejudice—to contend with. The general condition of things, as found (which is almost

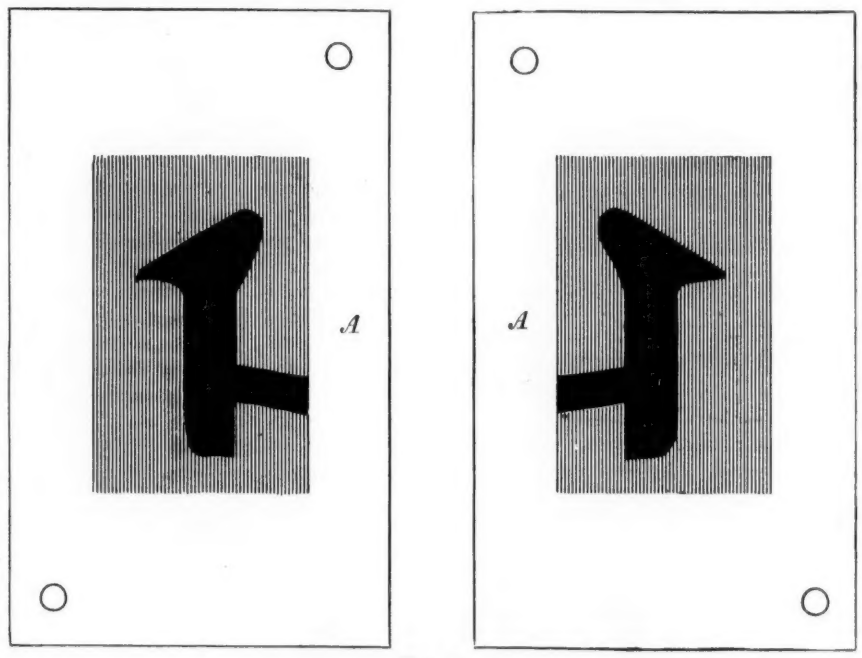


FIG. 2.

incredible), I won't stop to explain now, but will come to my subject.

I found the engine—an upright slide-valve, and of the very oldest pattern—pounding fearfully. My first impulse was, as Mr. Watson says, to key her up all 'round; but as I could get no information from any one as to her peculiarities—being looked upon as a sort of intruder—I decided to "let her run" one day and watch her. This was Saturday. Sunday I disconnected the rod, took off the binder; tried the pin; found it out of round a $\frac{1}{16}''$, and not at right angles with center line of cylinder. Tried level on main journal; found it worn eccentric-shape, with a shaft sprung behind it $\frac{3}{16}''$. I saw at once that I could not do any good by keying-up, and so put her back where I found her—all at my own expense—and reported my discovery on Monday morning, recommending a thorough overhauling as the only remedy. I was here met with the reply that she "had always run all right, that Mr. ——— had no trouble, &c., &c." Monday I inquired 'round for any information that would throw light on the affair. I found that a short time before a *new* set of gear wheels were attached *directly* to the crank-shaft. I found that in putting in this machinery the out-board end of the crank-shaft was "leveled" without any regard to the cylinder or its connections. The duty of the engine, among other things, was to run a bark mill, connected *directly* by the wheels just mentioned, to the crank shaft, and a hide mill, run from a counter-shaft and driven by a belt.

My engine grew worse hourly; began to beat dreadfully, and pounded so loud as to be heard three hundred yards off. I had many visitors, curious to see how the "new engineer was doing;" and, so far as I could judge by outward appearances, the "new engineer" was not held in very high esteem. It was even suggested that the "old one" would be better, "with all his faults." But I stood it all; not that I could not willingly "get up and dust," but I was determined to sustain my opinion and former record. Finally, things got so bad that she broke both bolts, which held the binder, and, with them, one of the lugs of the eccentric strap. Some wise ones, who "knew all about such things," were ready to say that it was caused by water in the cylinder; but I resented the slander and still held on. We fixed up the strap, got new bolts, and started up again, for a few days, the proprietors being convinced that "she could not be run so." But still there hung a cloud over the engineer, about whom the opinion of a practical machinist was sought, which, thanks to his honesty, we are happy to say, was not unfavorable.

Now, the point that I would call particular attention to is the arrangement of gear wheels referred to. It has been maintained, by myself and others, that they should not be attached *directly* to the crank-shaft, for the reason that any difference in the condition of the bark to be ground, or any variation in the mode of feeding, acts directly on the engine. This the builders of the machinery deny. If some of your readers will throw some light on this subject, the writer will not only be thankful, but grateful for the information; besides, it will set clear, in a great measure, a question which perplexes many in this vicinity.

But, to return. We got our engine overhauled, and found it to be just as your humble servant represented—only worse. We are running again, but it is only a question of (very short) time, owing, as we think, to those gears, when the whole thing will be back where it was.

I have some remarks to make about carelessness of management of steam boilers, but will defer to another time.

Very respectfully, &c.,
M. A. CHAMBERS.

Salem, Mass., Feb. 8th, 1880.

Boiler Proportion and Contruction.—Grate Bars.

BY WM. H. HOFFMAN.

This subject requires more attention than the writer will be able to give it in this paper. As there are many varieties of steaming fuels, there must necessarily be many kinds and grades of grate bars.

Pea coal, for instance, will not burn to advantage on bars intended for nut size, as about one-fifth of the fine coal will fall through the bars before it is half consumed, and putting nut size on to pea coal grates will result in failure much sooner, as imperfect combustion will be the result and carbonic oxide the product.

We will first consider the ordinary stationary set-bar. These, as castings, should be designed with care to insure long life. Those for pea coal must, of course, be the thinnest, as the bars for fine pea coal should be *no* more than $\frac{3}{8}''$ apart and $\frac{5}{16}''$ is best, but not less. The width of bar on the top side should be about $\frac{3}{8}''$, with a groove $\frac{1}{8}''$ wide running its length. These bars give the best results when cast in sections or nests of three. For a furnace over three feet long they should be made in two lengths, the central ends resting on a center-bearer bar. By making them in this manner they will not warp to any extent. They are easily handled and they need not be deep. Take, for instance, a five and a half ft. furnace (which is long enough for any boiler), the bars would each be two feet nine inches long, and $3\frac{1}{2}''$ in depth will be ample. The thickness near the top should be $\frac{7}{16}''$, and at the bottom edge $\frac{5}{16}''$. Unless the draught is *very* good, blowers must be used with pea coal.

For nut size coal the bars can be made in one length, except in cases where the blower or jet is used, then *always* in *two* lengths.

A bar five-and-a-half feet long should be $5\frac{1}{4}''$ deep at the center, $\frac{1}{4}''$ wide on top, with a groove $\frac{1}{4}''$ wide and $\frac{3}{8}''$ deep running its length, the upper and lower edges $\frac{1}{4}''$ and $\frac{3}{8}''$ thick respectively, the distance between bars no more than $\frac{5}{8}''$, no less than $\frac{1}{2}''$. For egg size the dimensions should be the same as those for nut, except the distance *between* bars, which should be no more than $\frac{3}{4}''$. A space of $\frac{1}{16}''$ works well. The best way to get good castings of grate bars is to use iron patterns. The straight bars are obtained by casting two or three in one section, as mentioned in connection with pea coal.

Unless a furnace is fitted with a shaking-bar, I think it should never be more than five-and-a-half feet long. Where the set-bar is six feet long and upwards it is impossible to clean the fires well.

Shaking-bars are now being used quite extensively. Among the best are the "Ætna," the "Ball" and the "Ohl." I have examined all three of the kinds mentioned after two years steady firing, and have found them in good condition.

The "Salamander" bar is an excellent one, and the "Tupper" is an old reliable, ready for any kind of hard usage.

None of the shaking-bars clean as well as the plain set stationary bars, as the former styles are nearly all placed transversely with the boiler.

I think hollow bars can be used with a *blast*, receiving the air inside the bar, and discharging it upwards through slots cast in the top of the bar. The ends, of course, would be connected to air pipes common to all, and so arranged as to be readily cleaned should they fill up with ashes, the bars would certainly last longer, as the metal would be more thoroughly exposed to the cool air.

I do not believe pea coal to be economical even at the low prices that it is generally sold at.

Testing Hazleton pea coal alone, under a Corliss hog-nosed two-flue boiler, shell, 48″ diameter, 30 feet long, two 14″ flues, with grate 3 ft. 9 in. by 4 ft., I found that the amount burned in eleven and a quarter hours was 3,065 lbs; then with half Hazleton pea, and half Buck Mountain pea, 2,586 lbs; then with Buck Mountain pea *alone*, 2,066 lbs., and then with Buck Mountain *nut* size, 1,838 lbs., the engine doing the same amount of work constantly.

When using the Hazleton pea coal alone the fires were cleaned *five* times in eleven and a quarter hours, and using Buck Mountain alone, only *twice*. The draught power of the chimney was good, the "Clark" damper being uniformly three-fourths open when burning the Hazleton pea, and *one-third* open with the Buck Mountain nut. Using Hazleton pea without a blast we have imperfect combustion; with a blast it runs like a flood on the bars, if the temperature is raised the *least* too high.

Safety Valves—Their Antecedents, Invention, History and Calculation.

BY W. BARNET LE VAN.

The frequency of requests for an explanation of the method of calculating the proportions of the levers and weights of safety valves, shows that the problem, simple though it is, is yet not properly understood by many of our mechanics and engineers.

For the benefit of the younger portion of your readers, as well as for some of the older, I have undertaken to give the antecedents of the safety valve, its invention, and a review of its history, and also to explain the manner of calculating and proportioning it in all its parts. I do not pretend to offer much that is new or original, but have tried to give that which will be the most useful, and in as simple language as is consistent with the subject matter.

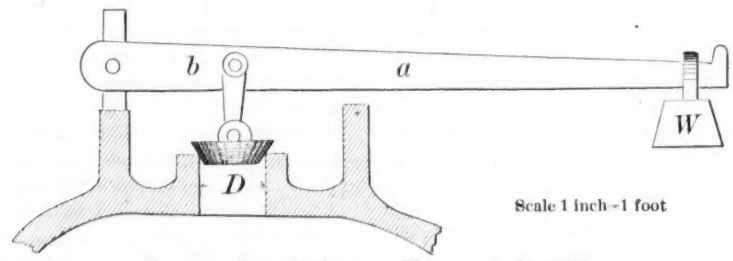


FIG. 2.—PAPIN'S SAFETY VALVE, A. D. 1695.

Mathematics cannot be wholly dispensed with in an explanation of this kind, but in each case, where possible, written rules, together with the particulars of working examples are given, so that the reader may study the subject for himself.

STEAM.

Steam has been noticed ever since the first heating of water and boiling of food for domestic purposes. The daily occurrence implied by the expression, "the pot boils over," was as common in antediluvian as in modern times; and hot water thus raised was one of the earliest observed facts connected with the expansion of vapor. From allusions in the most ancient writings, we may gather that the phenomena exhibited by steam were closely observed of old. Thus Job, in describing Leviathan, alludes to the puffs or volumes that issue from under the covers of boiling vessels: "By his neesings a light doth shine," and "Out of his nostrils goeth smoke (steam) as out of a seething pot or cauldron." In the early use of the vessels last named, and before experience had rendered the management of them easy and safe, females would naturally endeavor to prevent the savory contents of their pots from flying off in vapor—hence attempts to confine it by covers; and when these did not sufficiently close, a cloth or some similar substance interposed between it and a stone or other weight placed upon the top *to keep all tight*, would also be very natural. Then as the fluid began again to escape, further efforts would be made to retain it by additional weights. In this manner, doubtless many a contest was kept up between a pot and its owner, till one gained the victory; and we need not the testimony of historians to determine which this was. In those times it was not generally known that a boiling cauldron contained a spirit, impatient of control, that the vessel was the generator of an irresistible power, and the *cover a safety valve;* and that the preservation of the contents, and the security of the operator depended upon letting the cover alone, or not overloading it; hence it no doubt often happened that the confined vapor threw out the contents with violence, and then it was that primitive cooks began to perceive that there was death as well as life in a boiling pot. In this manner, we suppose females were the first experimenters on steam, and the earliest witnesses of steam boiler explosions.—[Ewbank's Hydraulics, 391.]

VALVES.

The bellows was probably the first instrument of which they formed a part. No other machine equally ancient can be pointed out in which they were required.

That the bellows is of antediluvian origin, there can be little doubt, for neither Tubal-Cain nor any of his pupils could have reduced and wrought *iron* without it.

Strabo attributed the bellows to Anacharsis, who lived about 600 years B. C. Pliny (B. vii, 56), attributes it with greater propriety to the Cyclops, who are supposed to have flourished before the deluge. The prophet Jeremiah, who lived long before Anacharsis, speaks of it in connection with metallurgical operations. "The bellows are burned, the lead is consumed of the fire; the founder melteth in vain." Isaiah, who lived still earlier, namely, in the eighth century B. C., alludes to the blacksmith's bellows: "The smith that bloweth the coals in the fire." Job, nine or ten centuries before the Scythian philosopher flourished, speaks of the blast-furnace as common: "They gather silver, and brass, and iron, and lead, and tin, into the midst of the furnace, to *blow the fire* upon it to melt it," (xxii. chapter, 20th verse). Homer, as might be supposed, could not fully describe the labor of Vulcan without referring to this instrument. His account of the great mechanical work is equally descriptive of a smith and his forge of the present day:

> Obscure in smoke, his forges flaming round,
> While bathed in sweat from fire to fire he flew;
> And puffing loud, the roaring bellows blew,
> * * * * * * * * * * *
> Just as the gods direct, now loud, now low,
> They raise a tempest, or they gently blow.
> —*Iliad*, xviii, 435, 545. *Pope.*

But by far the most important improvement on the primitive bellows or bag, was the admission of air by a *separate* opening—a contrivance that led to the invention of the *valve*, one of the most essential elements of steam, of water, as well as pneumatic machinery. The first approach to the ordinary valve, was a device that is still common in the bellows of some African tribes. A bag formed of the skin of a goat, has a reed attached to it to convey the blast to the fire; and the part which covered the neck of the animal is left open for the admission of air. This part is *gathered up* in the hand when the bag is compressed, and opened when it is distended. (Ewbank's Hydraulics, 235.)

The spindle valve, or such as have *long* shanks to prevent their rising too high, and to guide them when descending, is said to be of French origin.

A safety valve is an appendage to a steam boiler, for the purpose of limiting the pressure of steam to that consistent with the normal safety strength of the boiler; it is, in fact, the weakest point of a boiler, for everything else resisting the steam pressure must be stronger than the *safety valve*—and its name indicates its office. Therefore, the physical laws involved in the operation of a safety valve deserve a careful study, because it is not only a safety for the steam boiler, but a safety for human life and property depending upon the proper construction of the safety valve.

A safety valve should be large enough to allow all the steam that may be generated in the boiler to escape with sufficient rapidity, to prevent initial blowing-off pressure being exceeded by more than five per cent.

It is supposed that the gradual increase of pressure can never take place if the safety valve is in good working order, and if we have proper proportions. It should, however be stated, that engineers and firemen do not, in practice, place their trust in the safety valve alone, and that to their watchfulness and attention, the public are more indebted for safety than to the apparatus which is designed to regulate the pressure.

It is, however, an indispensable addition to a steam boiler, and should be made, if possible, so that under its automatic action, no considerable increase of pressure will be possible from ordinary evaporation.

Every safety valve should be so located, that it can be opened by hand at least twice each day; or, if not convenient to so place it, a cord should be secured to the lever or stem of the valve so as to operate it as above, to keep the valve free and in good working order.

One of the simplest forms of safety valve is that called the "positive safety valve," in which the weight is placed directly above or below the valve, and acts without the aid of levers—the valve being flat, conical, or spherical—thus exposing a greatly increased area when opened. This is a meritorious feature, as the experiments of Baldwin, Richardson, Adams, and numerous safety valve makers have proven. See Fig. 1, *O* representing outlet for blow off.

This is the oldest form of safety valve

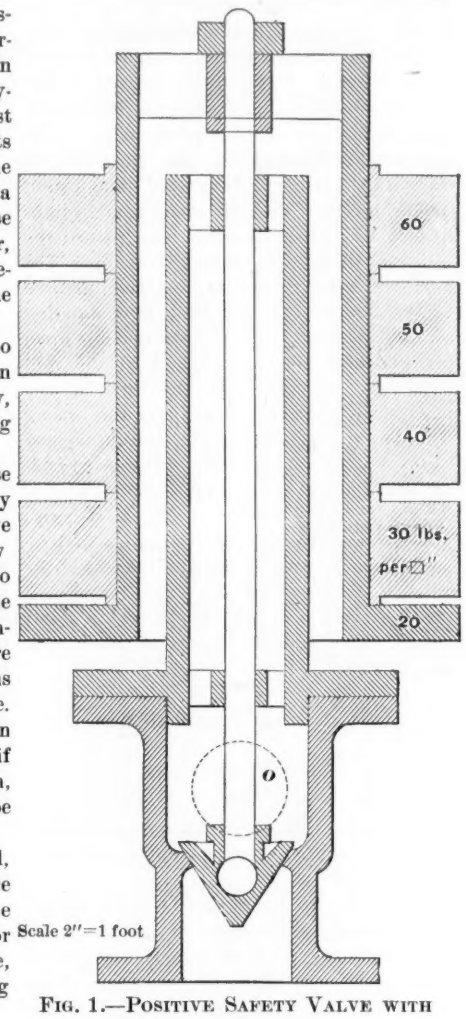


FIG. 1.—POSITIVE SAFETY VALVE WITH CONFINED BLOW-OFF.

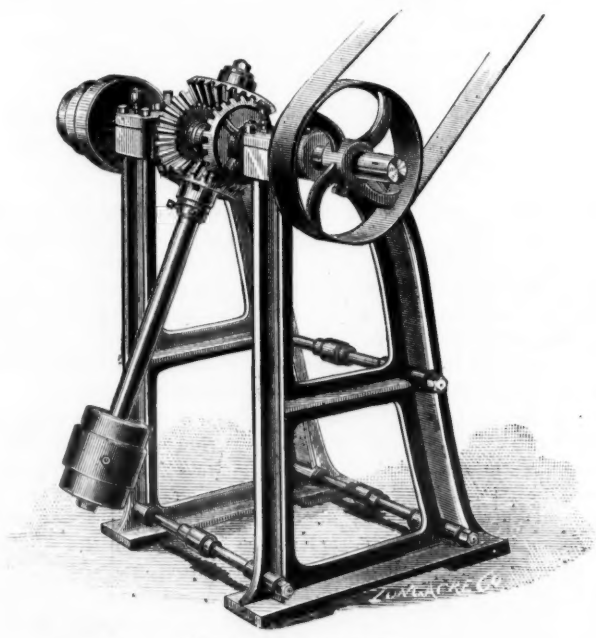
formed a water, the other a vapor, bath. On the top of each is a conical valve, opening upwards. These served both to let out the superfluous steam and to introduce water. Glauber, who contributed several valuable additions to the mechanical department of chemistry, has figured and described, in his Treatise on Philosophical Furnaces, the modes by which he prevented glass retorts or stills from being burst by the vapor. A long stopple or conical valve was fitted to the neck of each, being ground air-tight to its sit, and loaded with a "cap of lead," so that, when the steam became "high," it slightly raised the valve, and a portion escaped. The valve then closed again of itself, "being pressed down with the leaden cap and so stopped close." (English translation, London, 1651, page 306.) The valve on Newcomen's first engine was of this description.

In this valve the steam pressure is directly opposed by the force of the weight or spring, and these two forces will balance each other when equal.

To find the weight required, or what tension to put upon the spring to balance the steam pressure, multiply the pressure of the steam in pounds per square inch by the area of the valve in square inches.

Example: A valve has a diameter, *D*, of three inches equal to an area, *A*, of 7.068 square inches, and the steam to blow off at 50 pounds per square inch, what must be the weight placed on the valve?

The area of the valve in square inches	=	7.068
Multiplied by the steam pressure	=	56
The weight in pounds will be	=	353.400



KENT'S DYNAMOMETER.

Kent's Autographic Transmitting Dynamometer.

The accompanying engraving represents a dynamometer used at the Stevens' Institute at Hoboken, during the recent experiments with machines for producing electric lights.

These experiments with their results have been published in a government report of the Light House Board, by Prof. Henry Morton, from which we print the following extract:

The power employed in driving the machine was taken by the use of a transmitting dynamometer, designed by Mr. William Kent, a graduate of the Institute, and built in the workshops of the Institute by the graduating class of 1879. This is in fact a

modification of the dynamometer invented by Mr. Samuel Batchelder, of Boston, nearly forty years ago. The modification consists in providing a method of making an automatic record, and of indicating more minute variations of the power transmitted. The accompanying cut represents the dynamometer without the recording attachment, and as it was used in the experiments. The construction of this apparatus and its mode of operation are as follows :

It consists, as shown, of two stout cast-iron frames, held together by bolts in bearings, in the top of which frames run two shafts, each carrying a pulley at its outer end and a bevel-gear wheel of 45° at its inner end. One of these shafts is the driving-shaft, connected by belt to the engine or other prime mover ; the other is the driven shaft, connected by belt to the machine driven. The power is transmitted from one shaft to the other through two other bevel-wheels of 45° gearing with the first, the shaft common to them and on which they run freely being at right angles to the axis of the two shafts first mentioned, and carrying at one extremity a heavy pendulum.

The bevel-wheels being connected, as shown, and the power being applied to the driving-wheel, the two intermediate wheels with their common shaft have a tendency to revolve around the driving-axis, which tendency is a measure of the force transmitted, and is resisted by the moment of the weight of the pendulum. In the Batchelder dynamometer the four bevel-wheels and their shafts are used, but the shaft connecting the intermediate wheels is always held in a horizontal position, and its tendency to revolve is resisted by weights and a sliding poise applied to an extension of one end of it, which is graduated like a scale-beam. In using the Batchelder dynamometer the operator requires to keep the beam constantly balanced, by shifting the poise on the scale-beam or the weights in the scale-pan hung at its outer end, to correspond with the variations of the power transmitted, and a record of the power is obtained by noting the weight on the scale-beam at each instant, and the corresponding number of revolutions of the driving-shaft. The horse-power is obtained by multiplying weight in pounds of weighting poise on the scale-beam by the distance in feet of its point of suspension from the driving axes, by the number of revolutions per minute, by 3.1416, and dividing by 33,000.

In the improved dynamometer the horizontal scale-beam with its weights and sliding poise has been dispensed with, and the swinging pendulum substituted. The tendency of the shaft carrying the two intermediate bevel-wheels, the prolongation of which shaft is the pendulum arm, to revolve around the driving-axis, is measured by the weight of the pendulum and its arm multiplied by the distance of their center of gravity from the driving-axis and by the sine of the angle which the pendulum arm makes with the vertical. When the pendulum hangs in a vertical position the force transmitted is zero, errors due to friction excepted, and when it is horizontal, the sine of the angle being equal to unity, the force is the maximum the apparatus is capable of recording. The weight of pendulum and its position on the arm being constant, the only variables to be considered in measuring the horse-power transmitted are the number of revolutions per minute and the sine of the angle of the inclination of the arm. These variables may be caused to automatically record themselves on a sheet of cross section paper by any one of a number of devices.

The dynamometer used in these experiments has a capacity for measuring 20 horse-power; a method is provided of measuring very small powers, which consists in lessening the moment of the pendulum and arm, first by shifting the sliding weight nearer the driving-axis; second, if still lighter moment is desired, by removing the weight from the arm entirely; or, third, if even still greater delicacy is desired, by counterbalancing the weight of the arm by adding weight to its upper end, above the upper intermediate bevel-wheel.

During the experiments one person attended to the running of the engine, dynamometer, and machine, while another recorded the number of revolutions of the dynamometer and the inclination of the weighted pendulum; the latter was read from a graduated arc fastened to the pendulum in such a manner as to be in the same plane with its axis; this arc, by the deflection of the pendulum, swung by a pointer attached to a cross-bolt at back of machine, and thus indicated the degrees of inclination of the pendulum. The friction of the dynamometer was obtained by loading its delivery shaft with a weight which produced the same pressure on the bearings as was brought on them when it was transmitting power to the light machines, and then noting the deflection of the pendulum to overcome the friction produced.

In the earlier experiments the readings of the dynamometer were recorded every fifteen minutes, and in the later ones every five minutes.

Photometric measurements were also made simultaneously with the reading of the dynamometer, and occasionally one or two between successive readings of the dynamometer.

Accident in Forging Steel.

A most remarkable accident occurred recently at the Vulcan Iron Works, Wilkesbarre, Pa. A couple of workmen were striking a bar of hot steel with sledges, when a scale was thrown off, about as large in

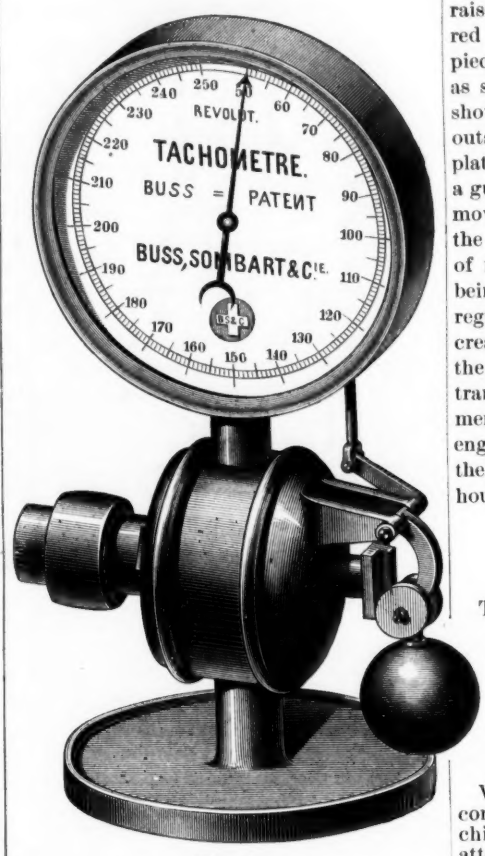


FIG. 1.

diameter as a three-cent piece, but not thicker than letter paper. This scale struck the arm of one of the workmen just below the elbow, passed through the arm and came out above the elbow on the opposite side. It made a frightful wound. An artery was severed and the blood spurted out in jets until pressure was applied to the artery above the place. A physician soon arrived and dressed the wound.

Speed Indicator for Revolving Shafts.

Buss, Sombart & Co., a firm at Magdeburg, Germany, have obtained a German "Reichspatent," for the invention of a new tachometer, and the following is a partial description of it. This apparatus, it is said, renders it possible to read the number of revolutions without intermission, by means of an indicator and a dial; it serves also, for the purpose, where it is needed, both to indicate the number of revolutions of a shaft, and to determine the dimensions of pulleys and gear wheels; also to discover the variations in speed of a balance wheel on a steam engine; to prove the activity of regulators, and to make possible the exact regulation of revolving machines, as water-wheels and turbines, which have no regulators.

The operation of the apparatus depends on the application of a rotation-pendulum. The dial is graduated so as to show the number of revolutions per minute (as in Fig. 1), and the whole instrument is so constructed that the divisions on the dial become perfectly uniform. Fig. 2 shows a gear wheel actuated by the indicator shaft and engaging with a smaller wheel which carries the index. A small spiral spring, which is placed around the indicator shaft, brings back the indicator to its starting point, and all inexactness, which would appear in consequence of the loose play of the teeth, is thereby removed. The shaft carrying the toothed arc, as shown in Fig. 2, passes through the outside rim of the instrument, and is attached at its lower end to a short lever. This lever is joined to the upper arm of an angle lever, the axle of which rests upon two holders standing out from the lower part of the rim.

These arms not being of the same length, there will be a corresponding increase and loss of power. The weighted lever which is furnished with two friction rollers, causes an inclination of the toothed arc as well as the indicator. While the weight exerts a power tending to pull the lever down, any pressure applied to the plate which presses against the friction rollers has a tendency to raise the lever and weight. The plate referred to is connected to the end of a small piece of pipe, which enters the lower case as shown in Fig. 2. A part of this tube is shown in section, while the rest shows an outside view of the same. This tube, with plate attached, is prevented from turning by a guide screwed to the face of the plate, and moves between the two friction rollers. In the case itself is enclosed a peculiar piece of mechanism, which rotates on the shaft, being driven by a pulley, and acting as a regulator. As the speed increases and decreases it causes a corresponding motion of the tube and plate referred to, which is also transmitted to the indicator. This instrument is designed for application to steam engines, hydraulic engines, also transmitters, the regulation of turbine water-wheels, spin houses, etc.

Machinery Accidents.

The *American Miller*, in an editorial on accidents from machinery—a subject we opened in a late issue—calls attention to the reprehensible neglect of mill owners and the carelessness of workmen, closing with the following well-timed advice:

While it is true that employees often become careless in approaching dangerous machinery, it is equally true that a workman attending to his business cannot be on perpetual guard against running gears, belts and shafts. It is an easy matter to inclose a gear in a skeleton frame that will not interfere with its accessibility, and yet it may save a life. Not long since, we saw in a mill an innocent-looking spur-wheel, only about a foot in diameter, that dragged an old miller down to

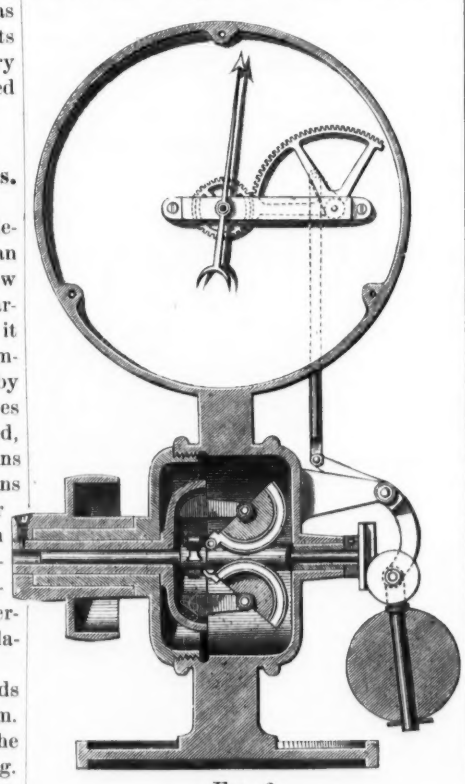


FIG. 2.

death. The wheel was at his feet, and he was reaching to adjust a belt above, when the wheel caught him and pulled him down. A few feet of timber and twenty minutes' work with saw and hammer would have made that wheel as harmless as it looked. There are mills which are positively dangerous from being crammed full of gears, and belts, and shafts, all in proximity to persons passing on the floor. This is a needless state of affairs. Most of the dangerous machinery of the mill can be made harmless by being made, in a measure, unapproachable, except when wittingly approached for the purposes of attention.

Still, workmen often grow careless in handling machinery and swell the number of horrible accidents unnecessarily. They should exercise the same circumspection after they have grown familiar with the mill that they did when they first entered it. They should be exceedingly careful that their garments are not so loose that proximity to a shaft or wheel may draw them and their wearers into danger, for the number of accidents occurring in this way is painfully large. Considering the number of each sex that ever enter mills and factories, probably more women than men are killed or maimed, which is due, not to their lack of caution, that we are aware of, but to the flowing style of their apparel. While it is the duty of the mill owner to render his establishment as safe as possible, no care of his can possibly take the place of caution on the part of his employees; and, therefore, we say to all who have to do with machinery: "Be careful."

Advances in Wages.

The nailers at the Fall River, Mass., Iron Works have received a second increase of 10 per cent. in wages, dating from Feb. 1.

The Williston mills, East Hampton, Mass., operatives held a meeting recently to try and obtain a ten per cent. advance in wages, but finally decided to accept the amount paid before the strike last spring.

The Newmarket, N. H., Manufacturing Company recently added 10 per cent. to the pay of its operatives, with a promise of more in the future.

The wages of the miners employed by the New Jersey Zinc and Franklin Iron Company, of Sussex county, have been increased 25 per cent.

The Ashaway Woolen Company and the Clarke Falls Company of Ashaway, N. H., have increased the wages of their operatives.

The Bennington, N. Y., woolen employees have had their wages advanced from ten to fifteen per cent.

The wages of the operatives in the Victory Mills at Schuylerville, N. Y., have been increased 10 per cent. again.

The Hallowell, Me., Cotton Manufacturing Company have made an increase of 10 per cent. in the wages of their operatives.

Corning & Co., of Troy, N. Y., have set up a train of rolls in their mill at the iron works for the manufacture of sheet iron plates, a branch of business which will give employment to a number of additional workmen. The wages of the employees have been increased.

The piece molders at the Clinton stove foundry, Troy, N. Y., have had their wages raised.

The labor strikes at Millville, (N. J.) are over, the bosses having granted the advances demanded.

The puddlers employed at the Burden Iron Works, Troy, have had their wages increased from $4.50 to $5.75 per ton.

A meeting of the Fire Commissioners was held last Saturday night, and it was decided to grant to the men of the department the increased salaries for which they have so long asked. A resolution was adopted increasing the pay of the regular men from forty to fifty dollars per month. The chief and assistants are raised $200, and the foremen have a proportionate increase in their pay.—*Syracuse Evening Herald.*

W. N. Sayre, secretary of the International Brotherhood of locomotive firemen, says that Col. Thos. A. Scott has promised that the wages of all the employees of the Pennsylvania company shall be advanced, those getting less than $50 a month, 10 per cent; over that sum, 5 per cent.

The Permanent Exhibition Co., of Philadelphia, have the alternative offered them to either raise $100,000 within six months to put in order the main building of the Centennial Exhibition which they have occupied so long, or to suffer its removal from the park.

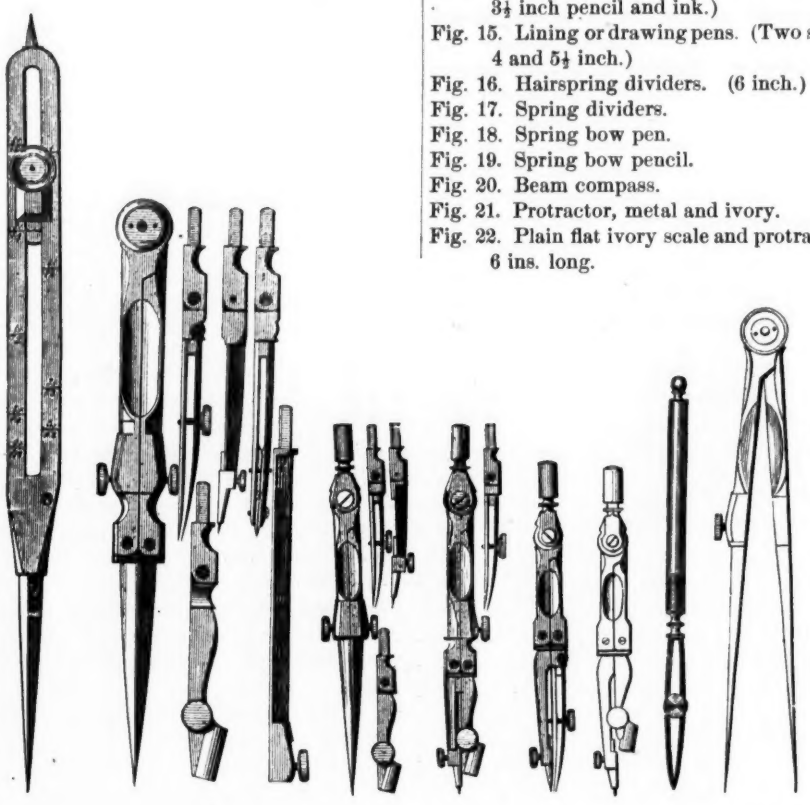
The Boston *Commercial Advertiser* contains a long and elaborately-illustrated article entitled, "Report of the Boiler Explosion." We were under the impression that a boiler explosion always furnished its own report at the time the explosion occurred.—*Detroit Free Press.*

Practical Draughting Instruments.

BY T. P. PEMBERTON.

The following is a complete list of instruments and drawing materials required by the practical draughtsman.

1. Drawing board. (Useful sizes 42″ × 28″ and 32″ × 23″.)



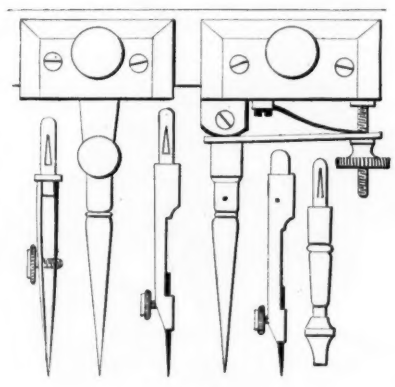
9. 10. 11. 12. 13. 14. 15. 16.

2. T square with fixed and shifting head. (Useful size 42″ long.)
3. Triangles. One, 45° and 90°. One, 30° 60° and 90° (degrees.)
4. Irregular Curves, Batter Slopes, and Ellipses.
5. Drawing paper. (See names and sizes previously given.)
6. Thumb Tacks and Horn Centers.
7. A small fine sponge.
8. A bottle of strong mucilage.
9. India rubber and Ink eraser.
10. Lead Pencils. (Siberian Lead.) HH, HHH, HHHHHH.
11. Small lead pencils for Bows. (Hard not soft.)

20. Steel spring dividers with thumb screw.
21. Sketch books and sketch blocks.
22. Sheet-metal gauge, speed indicator, universal square.
23. A complete set of English, Swiss, French or German silver drawing instruments comprise:—

Fig. 9. Proportional dividers.
Fig. 10. Large bows (6 inch pencil and ink).
Figs. 11, 12, 13, 14. Medium bows. (4½ or 3½ inch pencil and ink.)
Fig. 15. Lining or drawing pens. (Two sizes, 4 and 5½ inch.)
Fig. 16. Hairspring dividers. (6 inch.)
Fig. 17. Spring dividers.
Fig. 18. Spring bow pen.
Fig. 19. Spring bow pencil.
Fig. 20. Beam compass.
Fig. 21. Protractor, metal and ivory.
Fig. 22. Plain flat ivory scale and protractor, 6 ins. long.

17. 18. 19.



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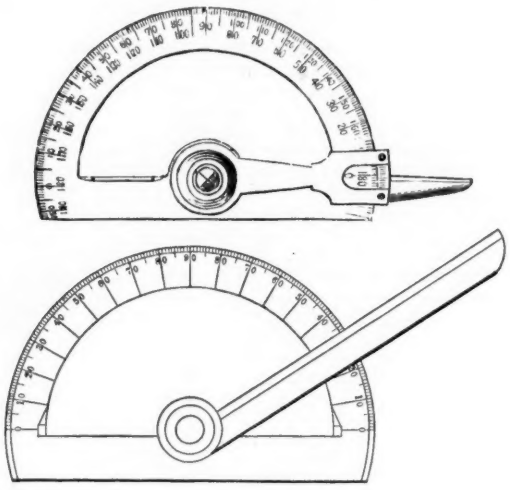


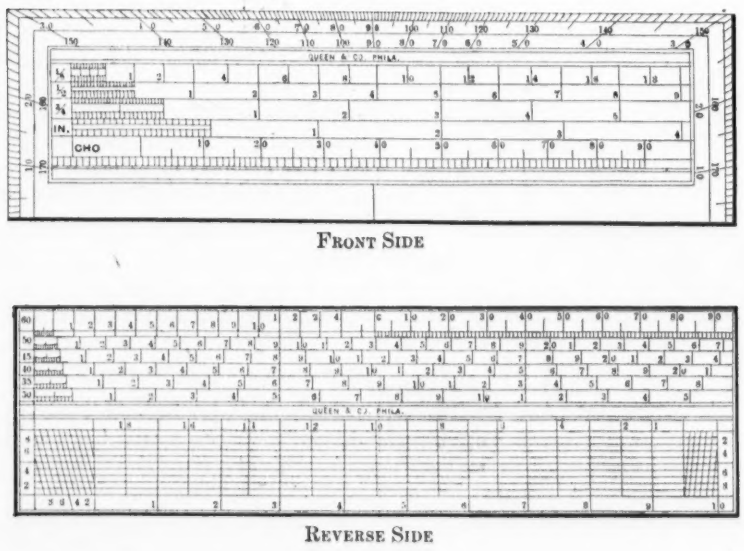
21.

Fig. 23. Flat ivory scale, 12 inches long.

Suggestions regarding the selection of drawing instruments have already been given. The student may be surprised to find that so many articles are required by the practical draughtsman, but there is not a tool named but what is more or less needed and at times indispensable for measuring and drawing. We repeat, however, that a few first class instruments are far more valuable (and valuable on account of their accuracy, durability and usefulness) than a large number of inferior and unreliable ones. On reference to the catalogues of the principal dealers in drawing instruments and materials, it will be found that there are a great variety of instruments as well as many articles which are not enumerated here. It may be asked, after reference to these catalogues, "Out of such a variety and number of things, what am I to select?" The following synopsis may assist in selection.

Drawing paper	Whatman's.
Pencils	Faber's.
Scales	Paper.
Instruments	English or Swiss.
Colors	Winsor & Newton's

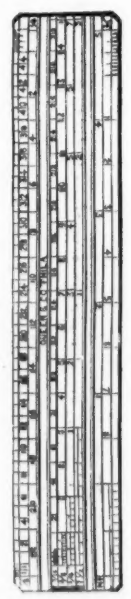
Alteneder's Patent Joint Drawing Instruments, of which a representation at Fig. 24 is given, are excellent in construction, accuracy and finish. The joints are so constructed as to prevent any irregular motion when the legs are opened or closed. To students and the inexperienced, the following suggestion is given. Consult an experienced mechanical draughtsman or the publishers of the AMERICAN MACHINIST before you invest. This is only doing justice to yourself. Those who are thoroughly posted by practical experience in such matters will always be glad to give advice to those who are not. Well-finished and accurate drawings can no more be made with poor tools than machinists can chip quick and evenly with blunted, nicked chisels. Inferior, blunted or bad marking instruments can be sometimes fixed up to be serviceable by those who know how to re-point them; something which every draughtsman should know how to do himself.



FRONT SIDE

REVERSE SIDE

22.



23

24

12. Small smooth file on which to sharpen pencils.
13. Stick of India ink. (Good quality.)
14. Set of cabinet saucers for ink and colors.
15. Camel hair water color brushes. (Sable hair are best.)
16. Knife ink eraser.
17. Paper or wood scales and boxwood rule, 2 feet.
18. Tape line. (100 feet.)
19. Steel squares, straight edges, outside and inside calipers.

Gleanings from the Foreign Press.

THE STEEL RAIL TRADE.

The *Ironmonger* says: It is well known that the British production is practically limited, and that it cannot be hurriedly increased, besides which the American mills are fully occupied, and those on the Continent are beginning to be very well engaged. Such being the case, it would seem to be almost impossible for any great quantity of steel rails to be sold by us on United States account this year, at all events nothing approaching to the 500,000 tons which some persons speak of as being the probable deficit in the American sources of supply. During the whole of 1879 we sent to the United States 23,750 tons of steel rails and 20,820 tons of iron ones, and to largely augment those figures this year would be to add much to our aggregate exports, which we cannot possibly do should the home lines need anything like the tonnage usually accredited to them. It is, therefore, highly probable that the American demand will be supplied by Germany—indeed we already hear that the mills in that country are running on orders from the States, and it would not be surprising to learn that by midsummer commissions will be refused in all directions.

ADDRESS TO MECHANICAL ENGINEERS.

At the last meeting of the British Institute of Mechanical Engineers in London, Jan. 22, the President made a pointed address, of which the following is the essential part:

The number of our members has greatly increased, the quality and interest of our papers have improved, and the attendances at our meetings are more numerous. I long foresaw that this removal was only a question of time, as soon as the present lines of railway had express trains direct to the metropolis, not only without stopping at Birmingham, but without going within 15 miles of it. The institution now so completely stands at the head of mechanical engineering in this country (and is admitted by all other institutions to occupy such a proud position) that it is but natural that it should rest in the metropolis, as its fit and proper home, and long may it pursue its peaceful and thoroughly useful course. The institution having, from the first, been conducted with a due regard to economy, has never been in debt, and the result is that it is now comfortably and conveniently settled in excellent offices well suited for its requirements for many years to come; this is the more satisfactory as it is most difficult to find a good site for such an institution in Westminster. I do not propose to-day to trouble you with anything like a history or *resumé* of mechanical engineering, as that has been done much better than I could hope to give it, but, if not trying your patience too much, I should

wish to say a few words (direct to the point) with regard to the position of this country among the nations in respect to the advancement of manufactures generally. Now, it cannot be doubted for a moment but that the manufactures and commerce of this country depend very greatly upon mechanical engineering skill and invention, and, if this country is to continue to be called "the manufactory of the world," we must, on no account, shut our eyes to what is now going on around us in many countries. I much fear that some manufacturers have so little enterprise about them that they consider they are doing enough if they make things (perhaps chiefly or entirely by hand) as their fathers did, in small numbers, instead of attempting to manufacture articles in a better manner, in large numbers, by machinery. They seem to forget that, in past times, the good sale here depended very much upon the fact that they had no rivals or competitors for the trade, owing to foreigners not having devoted themselves to manufactures, and, indeed, having been very much hindered from so doing by very frequent wars taking place actually in their countries, whereas we have had no wars in this country for 200 years or more. Now, there is one important fact that has, perhaps, hardly been considered sufficiently by mechanical engineers and manufacturers generally, and it is this: when railways first began to spread over the Continent, engineering tools and machines were just springing into existence in England, and partly for the purpose of manufacturing the locomotives, for which there was a large demand. Then, when foreigners had to re-

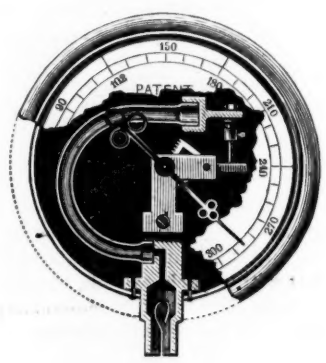


FIG. 2.

pair their engines, they bought engineering tools and machines, and were able to work them without any very highly skilled labor, such as our old millwrights were obliged to possess in our fathers' and grandfathers' time; so that in a very short time, despite the want of skilled labor, the Continental firms became not only the manufacturers of their own locomotives, but of all other kinds of machinery. What must now be done, if our commerce is to flourish and our manufacturers keep to the front, is—that instead of trying to avoid adopting any new improvements, and refusing to experiment or incur any outlay for the purpose of trying to improve their wares and the means of producing them, they should join heartily, and

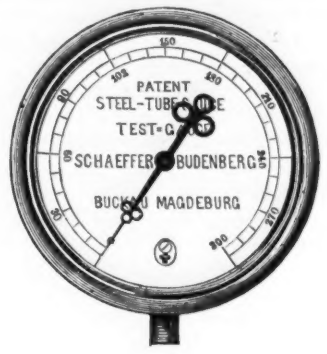


FIG. 1.

wonderful effect in promoting progress and increasing the prosperity of the country. Sometimes it has struck me that mechanical engineers hardly seem to think it their province to strive to improve manufactures generally, and confine their attention too much to tools and engines, more particularly for engineering purposes, whereas a little more, or I would say a great deal more, co-operation between manufacturers who know what is wanted, and engineers, who would quickly find out how to accomplish it, would be of the greatest possible advantage to the commerce and manufactures of the country. A difficulty well stated is half overcome already.

But our manufacturers and mechanical engineers must come together and interchange their ideas and correspond freely, if any great good is to be accomplished in maintaining this country in the proud position of being the manufactory of the world; and as some of us gave an earnest helping hand to establish this Institution, so I will venture to ask all our members to join hands with our friends the manufacturers to make as much use as possible of the advantage of this Institution, which, as stated in our rules, was established "To enable mechanical engineers to meet and to correspond, and to facilitate the interchange of ideas respecting improvements in the various branches of mechanical science, and the publication and communication of information on such subjects."

New Steam and Recording Gauges.

The application of a seamless, tempered steel tube spring to a steam gauge has been a matter of much experiment, and many unsuccessful attempts have been made.

The accompanying illustration, Fig. 1, represents a gauge complete, in which this principle has been made to work successfully. The construction of this gauge is shown by the sectional view, Fig. 2. The steel tube spring is made from a solid piece of steel, and seamless; the thickness of which varies according to the pressure required to be put upon it. This spring is tempered, thus rendering it very elastic and not liable to change its form. A thread is cut upon each end, one of which is screwed into the bottom connection, which is to be attached to the boiler, and also bears the movement of the gauge, while a cap is screwed upon

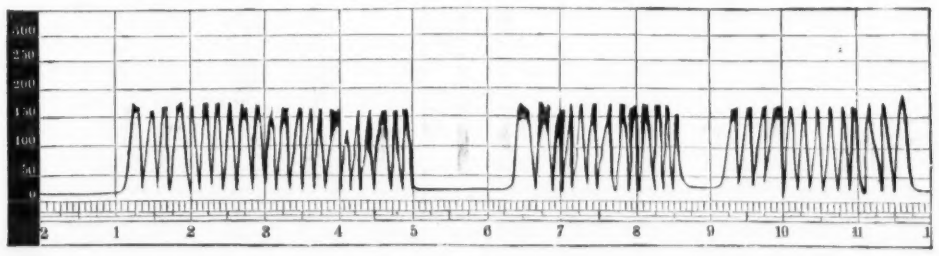


FIG. 4.

mechanical engineers should do so too, in adopting and improving machinery to produce in a better manner, by power, in quantity, and therefore economically, what had previously been done in a small way expensively by hand. Often, too often, a good thing is allowed to lie dormant for years, because each manufacturer thinks he will let some one else in the trade spend his money to try the proposal; but the energy shown in the United States in proving a new thing as soon as brought out (and on the Continent also very often), and adopting it if good, has a

the other end. These connections are made of brass, which, after being screwed fast, are soldered so as to make the joints doubly secure against leakage. The movement of this gauge is very simple, consisting of a toothed arc which connects with a small pinion. By means of a small set-screw the gauge may be adjusted at any time.

In order to protect the inside of the steel tube from corrosion it is filled with glycerine. The opening is then closed by a suitable cap, in the center of which is placed a small bent tube, so that when this tube is in its place it forms a siphon within the gauge, as shown. This arrangement effectually prevents the escape of the glycerine, yet allowing the pressure from the boiler to enter uninterrupted. These gauges were designed more particularly for locomotives, where an accurate instrument is required, which will stand the violent action to which locomotive gauges are subjected. They are also very sensitive to the slightest variation in the pressure, and from their general construction give evidence of great durability. The principal European railroads have been using these gauges for some time, and they are now being introduced upon the principal railroads in this country. It is not the design of the manufacturers to make a cheap, which also means a poor,

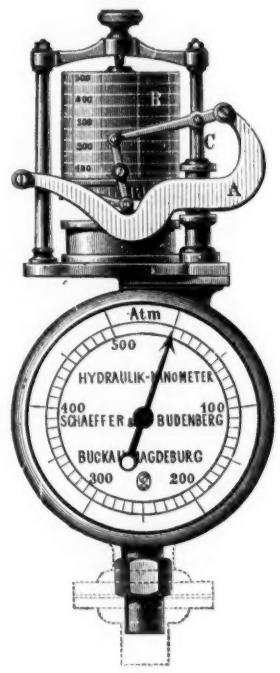


FIG. 3.

article, but to make an instrument which will be reliable at all times.

A recording gauge is shown in FIG. 3, which has been designed for the purpose of furnishing a true record of the variation of pressure in steam boilers, hydraulic presses and pumping engines. The pressure-gauge is in construction the same as the one just described, the dotted lines showing the original construction. A stand is attached to the top of the gauge, upon which is placed a parallel motion, essentially the same as that used on the Richards Indicator. The motion of the gauge-spring is transmitted to the parallel motion by means of a small rod *C*. A pencil is attached, as in the indicator referred to, but with this difference: It is held in a spring holder which presses the point gently against the paper attached to the cylinder *B*. Motion is given to the drum by means of a very fine clock movement, which is contained in a case directly under the drum.

The drum is divided into twelve parts, the figures being engraved upon the edge, which represent twelve hours, and as the drum makes one revolution every twelve hours the paper must be changed at the end of each revolution. To use the instrument, the paper must be placed upon the drum so that the figures upon both the paper and drum may correspond. The paper is kept from slipping by small pins, and is held together by simply gumming one edge and pressing it together. The thumb-screw upon the top of the drum must then be slacked, and the drum moved round so that the pencil comes directly over the figure twelve. The clock must be wound up, the nut tightened and the pressure let on from the boiler. By turning the lever *A*, the pencil is brought in contact with the paper on the drum. Tighten the nut near *C*, which holds the lever in position permanently.

The figures on the paper and the position of the pencil must agree with the position of the pointer upon the dial of the gauge.

If the gauge is now left to itself the pencil will rise and fall as the pressure fluctuates in the boiler, and the paper being carried forward will make a diagram similar to that shown in Fig. 4, thus showing the variation of the pressure. It is intended to have this instrument placed in an elegant glass case, which may be locked to protect it from dust and from being tampered with.

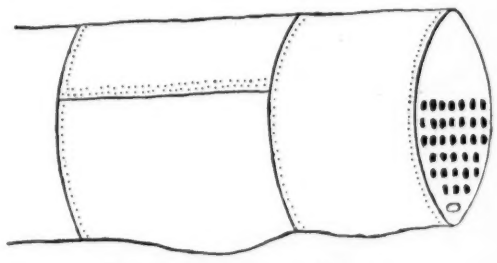
These gauges are manufactured by Messrs. Schaffer & Budenberg, of Buckau, Magdeburg (Germany), and are being introduced into this country by W. Heuermann, 40 John St., New York., from whom further information may be obtained.

A Danger Signal.

We recently illustrated an accident to a water-tube boiler, showing the dangers users of steam power are exposed to at the hands of careless employees; and this week we are enabled to present an illustration of the results of similar carelessness (that is, letting the feed stop) on a return-tubular boiler.

The engraving represents a portion of a large steel return-tubular boiler, fifty-four inches diameter, which is one of a pair recently put in a large factory in Philadelphia. By some means the water supply was cut off, and the lower sheets heated to redness, when the internal pressure drove them out, as shown, to a distance of 4½ inches from a true line. That serious results did not ensue to life and limb, is due wholly to the excellence of the metal composing the boiler. It is hardly necessary to point out that an iron boiler would have ruptured at the point of stress and "gone into the blue empyrean," as the poets say when any thing bursts! This boiler will have to be removed to the shop and re-built on the damaged end, at a cost of several hundred dollars.—Moral: Attend to your business.

The contract for an electric light of 10,000 candle power, to be placed in the dome of the County Court House, at Wabash, Ind., inteaded to light that city, has been let to the Brush Electric Light Company, of Cleveland,



BULGED PLATE IN A BOILER.

Ohio, for $1,800. The agreement states that should the light prove unsatisfactory the city shall be at no expense. A guarantee for a perfect light has been given by the company.

The stove and machine moulders of Pittsburgh, to the number of over 1,000, are on a strike for an advance. The few remaining at work are non union men, with the exception of those employed by two firms, which have acceded to the demand. The machine moulders demand an advance of 10 per cent, and the stove moulders ask a return to the old card rates. The machine foundries are extremely busy at this time, while the busy season with the stove manufacturers is about over. These moulders belong to the same union, one of the first established in Pittsburgh. The stove manufacturers have an organization, but have as yet taken no action.

The strike of the laborers at the American Iron Works, Pittsburgh, has thrown 1,500 men out of work, and all departments of the mill are shut down. The strikers still contend for $1.50 per day, while the firm offers $1.25. The strikers state it was a case of necessity on their part, as the wages they were in receipt of were insufficient for their support, and say they are only asking what is paid in other mills, such as Painter's, Dilworth's, and Chess, Smyth & Co.'s.

AMERICAN MACHINIST

PUBLISHED WEEKLY

BY

American Machinist Publishing Co.

HORACE B. MILLER, Prest.
LYCURGUS B. MOORE, Treas.
JACKSON BAILEY, Vice-Prest.
DAVIS STRONG, Sec'y.

96 Fulton Street, New York.

JACKSON BAILEY, Editor. HORACE B. MILLER, Business Manager.

LEWIS F. LYNE, Mechanical Engineer.

The American News Company.
Publishers' Agents, New York.

The International News Company,
(Formerly the Willmer & Rogers News Co.)
11 BOUVERIE STREET, (Fleet St.) LONDON, ENG.
Will receive subscriptions for the AMERICAN MACHINIST at 17 shillings per annum, postage prepaid.

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☞ *We are not engaged in procuring patent rights, or in selling machinery; nor have we any pet scheme to advance, or hobby to ride.*

☞ *We invite correspondence from practical machinists, engineers inventors, draughtsmen, and all those specially interested in the occupations we represent, on subjects pertaining to machinery.*

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NEW YORK, FEBRUARY 28, 1880.

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A National Association of Mechanical Engineers.

Before this reaches our readers a meeting will have been held at the office of the AMERICAN MACHINIST, at the call of Prof. John E. Sweet, for the purpose of founding a national association of mechanical engineers. This movement has been almost spontaneous in its origin, having grown out of a widely extended and increasing desire for a generally recognized society, composed of active and progressive members, to take the lead in dealing with important problems in mechanical engineering. While in many of the large cities engineers' clubs are suitably organized and smoothly working, so far as we know up to the present time, no national association of mechanical engineers has been projected. In England the Institution of Mechanical Engineers has been in profitable existence over thirty years, and now numbers 1176 members. During that period mechanical advancement has been so much more rapid in America than in Europe that the art of mechanical engineering has reached a stage in this country which is recognized as superior, in many important particulars, to the best practice on the other side of the Atlantic. That a representative society, holding regular meetings and permitting a comparison of views, with free discussion on methods and processes, would prove of immense value to the manufacturing industries of our country does not admit of a doubt. That the time has come for the establishment of such a society is the expressed opinion of a large number of progressive engineers both East and West.

To us, who have been brought into especial contact with hundreds of this class during the two years and more the AMERICAN MACHINIST has been published, it is apparent that such a society, in order to possess the highest usefulness, must include in its active membership not only the consulting engineers, who are not directly connected with any manufacturing establishment, but also the constructive engineers, who as foremen, designers, superintendents, or proprietors of works direct operations requiring the exercise of engineering skill.

It is proposed to organize a society to include both these classes of engineers. As flourishing societies of civil and mining engineers, master mechanics, and master car builders exist, there is no good reason why a well-founded society of mechanical engineers will not do as well.

Particulars of the first meeting will be given in our next.

Profitable and Unprofitable Mechanics.

In almost every part of our country at the present time there is a loud call for skilled machinists. The demand keeps ahead of the supply, and is likely to be so for several months to come. But what makes a skilled workman? Some men follow a trade a score of years without becoming proficient in it, while others acquire the aptitude of experts in two or three years after passing their apprenticeship. It is evident that the qualifications of a skilled workman do not necessarily come from a long term of shop practice. The skilled workman, it will be observed, exercises his brains as well as his hands. The man who acquires a skill superior to that of his fellow workmen and commands better wages is the man who *thinks*. While the take-it-easy mechanic, whose leading ambition is to put in a certain number of hours a day and get away from the shop, is bothering the foreman for instructions in overcoming some difficulty, his thinking fellow-worker contrives a plan of his own and accomplishes the desired object. The demand is for more mechanics who think, not only in the shop but out of it—those who probe outside sources of information in order to advance themselves in those qualifications which are sure to command recognition. Just here the question arises whether mechanics are hired to think as well as to perform manual labor. Some act upon the supposition that hand work is all they are expected to furnish. This class of workmen make progress only at a snail's pace. The difference between the reading and thinking mechanic and his neighbor, who "works by rote," is just the difference between the mechanical engineer and the machine feeder. It is not difficult to engage a shop full of the latter, even at low wages, but the former must be sought for with some effort and suitably compensated for their services. It is much cheaper to pay an extra good workman high wages than to hire a second or third-rate mechanic at a low figure, even though he finishes every job as well as the superior artisan. There must be a loss when machines and tools are not worked to their full capacity. The unambitious workman, who is charged with running a lathe, a drill, a planer, or a milling machine, can make his employer lose about as much as his wages amounts to, by keeping up fine feeds, slow speed, and consuming unnecessary time in making changes. Foremen are largely responsible for this loss, which in many shops we have visited would, at the close of every year, figure up a handsome percentage on the capital invested.

Not long since a machinist, who called at our office, mentioned some interesting points of practice in a Paterson, N. J., locomotive shop, where he had previously been employed, as contrasted with others in a locomotive shop a few hundred miles away, in which he was then engaged. The planing of a certain number of boxes was considered a good day's work where then employed, but the Paterson shop required the finishing of a number per day, about thirty per cent. higher. The difference in equipment of the two shops is but little in favor of either, but the balance of success has been very much in favor of the Paterson shop. The other is noted for persistently cutting down workmen's pay. Perhaps some enterprising foreman may, some day, explain to the proprietors why they don't make more money.

Advances in wages have become quite common in many manufacturing industries. In many cases proprietors of shops have anticipated things by voluntarily giving notice of an advance. Again, workmen have asked for a reasonable increase of pay and obtained it without argument. In other instances they have gone on a strike and made a demand for the increase while standing out. It is not hard to discover which plan is the best. The union stove moulders of Pennsylvania, recently held a meeting and decided to make a general strike for an advance of pay. It does not appear that they were to make any straightforward request for what they wanted, but to declare hostilities at once. This is certainly an unwise course to pursue.

The Astor Library.

Some of the daily papers are stirring up the subject of opening the Astor Library in Lafayette place, in this city, evenings as well as in the day time. This library, which is stocked with books of great practical value to artisans and others, is always closed except from 10 A. M. to 5 P. M. Between those hours none but idlers, politicians, or literary individuals can avail themselves of its advantages. It costs $12,000 to $15,000 a year to run the Astor Library, yet it is of little avail to the people whom its founder designed to benefit. There is no good reason why the library should not be kept open until 9 or 10 o'clock every evening.

The Duty on Steel Rails.

The most pronounced movement against the tariff, since the opening of Congress, is a concerted effort by the railroad companies to lower the duty on steel rails from $28 a ton to $10. A petition was drawn up and signed by many of the companies, the signatures being obtained by the efforts of H. V. & H. W. Poor, of this city, whose names appear in an advertisement of a foreign rail manufacturer as American "correspondents." The duty of $28 a ton on steel rails has been in force since January 1, 1871, covering a period of the most active railroad extension ever known in this country. Previous to that date almost all steel rails used on American roads were imported from Europe and paid for at extremely high rates. There are now eleven Bessemer steel rail works in the United States, each paying from $1,000,000 to $3,000,000 a year in wages to workmen, exclusive of what is paid by the mines, furnaces and machinery establishments that furnish raw material and other supplies to these mills. The price of steel rails, compared with cost of pig iron as a standard, has fallen remarkably since the establishment of Bessemer works in this country. That the reduction of duty would inure to the benefit of foreign rail makers and their workmen, no one will deny, but that it would benefit any large class of our own citizens is a question about which, to say the least, there are serious doubts. Like any other important question of public policy, this should be well considered and both sides given a respectful hearing before making a change. The petition laid before Congress sets forth:

"That the railroad interest of the country is still in a very depressed condition, the total investment in it yielding only about four per cent. annually."

Our thoughtful readers will not be slow to notice the ingenuity of this wording. "Total investment," as represented by watered stock, is the basis upon which the (average) four per cent. per annum is realized. Whether Congress will be obliging enough to enact laws to make this watered stock more valuable, remains to be seen. The petition, while it dwells upon the advantages of a "healthy foreign competition," very wisely avoids any mention of any prospective public benefit to be derived from a reduction of duty on rails. The railroad companies are desirous of buying rails more cheaply, but do not propose to give the public any cheaper freight or passenger rates, nor to raise the pay of their employees in consequence of securing what they ask for. They do, however, call attention to the increased revenue to be derived from a reduction of the duty from $28 to $10 a ton. This must, therefore, mean at least an increase to three times the quantity now imported. If a considerable proportion of the steel rails used in the United States are made in Europe, and the price reduced, our steel rail mills instead of enlarging, as they now are doing, will need to discharge a large number of their workmen and reduce the wages of the others. It would be wise for Congress to defer action until all interests affected can definitely be heard from.

It is an important household economy just now to save the cotton and linen rags, and old newspapers, as they are in demand at good prices. The advance in printing paper (fully 25 per cent.) has stimulated inquiries for all classes of paper stock. The gathering of rags and old paper in a family may be made to realize various sums for pin money.

In our issue of Feb. 14th, 1880, in the extract entitled Cost of Locomotive-duty, the following should have been the reading, Dollar marks were used by mistake.

Average cost per mile for repairs,	3.55 cts.
" " Engineers, firemen, and wipers,	5.12 "
" " Oil, waste and tallow,	46 "
" " Fuel,	7.24 "
Total average cost per mile run,	16.37 cts.

The average is therefore $16.37 instead of $12.31 for each engine per 100 miles for men, fuel and repairs.

We would like to see a detailed statement from the roads under consideration, showing the average locomotive running expenses for one year, as these fluctuate considerably from month to month.

The indications are bright for a lively spring trade in all legitimate branches of business. Reports from all points, both East and West, confirm the favorable indications. In the machinery business unusual activity is everywhere manifest. Many shops are running day and night with orders for three to six months ahead. No spring, for seven or eight years past, has come with such favorable business prospects.

In England there are over 300 bicycle makers who have invested $5,000,000 in machinery, and who pay out $6,000 a week in wages. It is said there are in use in England over 150,000 bicycles. The bicycling mania is spreading in this country, and business is likely to be afforded many machine shops in manufacturing these contrivances.

American Representation at the Melbourne Exhibition.

The application for 30,000 square feet of space in which to display American exhibits at Melbourne, was met by a grant of 28,500 square feet, as the demands for space from other countries have been greater than was anticipated. The U. S. Government agent, Mr. T. R. Pickering, has received about 100 applications for space to exhibit, for which permits have been given. These displays will include machine tools, wood-working machinery, portable steam engines, fire-arms, watches and watch making tools, shovels and spades, tackle blocks, lawn mowers, axes, and other heavy edge tools, printing presses, fanning mills, picks, cabinet locks, scales, cabinet organs, horse nails, farm wagons and buggies, sewing machines, type, cut nails, lamps and lanterns, tinners' tools, friction pulleys, saddlers' tools, lubricating oils, leather belting, builders' hardware, steam packing, railway car seats, chilled car wheels, barbed wire fence, and a good display of agricultural implements.

The time for receiving applications for space has been extended to March 10th.

Business Specials.

Forty cents a line for each insertion under this head.

Manual of Power for Machines, Shafts, and Belts, with the History of Cotton Manufacture in the United States, by Samuel Webber, C. E., copyrighted 1879. Only work of the kind extant; 240 pages. Price $3. Address, D. Appleton & Co, New York, or the author, Manchester, N. H.

Lathe Attachments for Milling Plane and Irregular Forms; Taps and Reamers fluted and Gears cut without removing from the lathe centers. For extended description, see AMERICAN MACHINIST, Sept. 13 and 20 issues. Send for circular to Wm. Main, Piermont, N. Y.

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Questions and Answers.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly and according to common sense methods.

(1) R. R., Shafton, Penn, writes: In your paper of January 3d is a diagram of a single eccentric link motion, by John McDonald, of Amesbury, Mass. In the drawing the eccentric is placed at a right angle with the center line of engine. Should it not rather be at a right angle with a line drawn from the center of shaft, to that point of the link to which the eccentric-rod is attached? An engine constructed with this kind of reversing gear, and eccentric placed on the shaft as in diagram, would run very well *one way*, but the valve would be considerably behind time when run the other. It will be well enough if any party is about to copy Mr. McDonald's plan of gear to convince themselves as to the correct position, and save probably a good deal of annoyance when they come to turn the steam on. *A.*—The eccentric should be set so that the center line, or throw, will be at right angles to a line drawn from the point of connection with the link to the center of the shaft, as the link is stationary. This was overlooked in making the drawing. The valve used with this device has neither lap nor lead, and is applied to a very small cylinder (4″x6″). This principle can only be used where economy of fuel is of very little importance, as neither lap nor lead can be allowed on a valve using this motion.

(2) J. S., Milwaukee, Wis., writes: 1. I am a beginner in the manufacture of light castings, and if you can, without inconvenience, instruct me how or where to get the Berlin Bronze, such as is used for finish on light work, also as to its application—does it require baking? *A.*—Berlin Bronze is a trade name adopted for a patented process for putting a finish upon iron. Each firm who are duly authorized to use this process has adopted a name of its own, such as Florentine, American dark, etc., which refer to the same process. 2. How can I paint castings a perfect white? I have experimented considerable but in vain. *A.*—We know of no better way than to clean the castings thoroughly and paint them with a good metallic paint. You are not alone in these experiments, for new things are being developed continually in regard to the treatment of castings.

(3) C. L. N., Worcester, Mass., asks: 1.—What chemical effect has prussiate of potash upon wrought iron as used in case-hardening? *A.*—The chemical effect of prussiate of potash upon wrought iron, is, like the hardening and tempering of steel, very imperfectly understood. About all that we can say in reference to it is, that it has the effect of converting the outside surface of the iron into steel. The depth of this hardening depends upon the time occupied by the process. 2.—Would the effect be the same when used on poor steel? If not the same, what would the effect be? *A.*—The effect would be the same, but more marked, owing to the change already produced in the manufacture of the steel. 3.—What brand of steel do the best makers use for twist-drills, taps, reamers, and cutters? *A.*—The manufacturers of drills, also taps and dies, are still experimenting with the different brands of steel. Some of them have abandoned the use of English steel, and have adopted the use of the best American steel with more successful results than they had experienced with the best English. 4.—Why are square threads used on the stems of large valves, and on the lead screws of lathes, and generally on pieces of large diameter instead of V-threads? *A.*—Because there is less friction upon a square thread than any other, consequently it will wear longer.

(4) F. D. W., Phila., Pa., asks:—How many pounds of lead in a tank (cubic) that will hold 500 gallons of water? The lead to be 4½ lbs. to the foot, and the rule for finding the same. *A.*—443.88 lbs. The rule: multiply the number of gallons by the number of cubic inches in a gallon; find the cube root of the product, which will be the length of the side of the cube. The square of this will give the number of square feet on one side, and this multiplied by the number of sides in the cube, will give the number of square feet in a cube to hold the number of gallons required. The number of feet multiplied by the weight of material per foot will give the weight. Thus:

$\sqrt[3]{500\times231^2}\times6\times4.5$ no. of lbs.=443.88 lbs of lead.

(5) C. M., Mechanicsburg, Pa., writes: I have been trying to get into a machine shop and have not succeeded. Could you inform me where or how to obtain a situation? *A.*—We refer you to our issue of Nov. 15th, 1879, in answer to the first question, where you will find directions, which, if carried out, will insure success. We have seen it successful in numerous cases. The most essential points are patience and perseverance.

MANUFACTURES

Our Fall River, Mass., correspondent sends us the following items:

The foundation for the new mill of the Cutler Mfg. Co., of Warren, R. I., is all in, and the building will be constructed immediately. Messrs. Manly & Wilbur, of Fall River, Mass., are the contractors.

The old Mount Hope Mill has changed hands. The new company organized Feb. 9th, and will hereafter be known as the Connecticut Mills. Ex-Mayor Crawford E. Lindsey is Treasurer, and Jos. D. Carr, Superintendent. A number of men are getting things in running order. The mill manufactures wide goods and will be started at once, after an idleness of fourteen months.

The Old Fall River Print Works (cotton mill) has been re-organized and is now called the Quequechan Mills, with Andrew Robeson as Treasurer, and H. G. Fenner as Superintendent.

The American Print Works, for many years in successful operation here, but of late meeting with many reverses, has at last been taken by the creditors, who formed last Monday (Feb. 2). It is hereafter to be called the American Printing Co., with Thos. J. Borden as Treasurer.

The Cotton Mills here are doing a rushing business, and the help are again agitating the question of more wages.

The Merchants' Mfg. Co. are building a large cloth room and store house.

E. L. Morse, St. Louis, Mo., has lately shipped one of his No. 9 feed-water heaters to the Champion Cotton Press Co., Memphis, Tenn., being the second one, this season, to the same company. He is also building a No. 9 for S. B. Steers & Co., Columbus, Miss., to be used in connection with an 80-inch cotton press. This is the fourth ordered by the same firm, within four months, for use in New Orleans, Selma, Ala., Dallas and Jefferson, Texas. The heater seems to be very efficient in clearing the mud and impurities from Western river-water before feeding it to a boiler.

The Depauw Plate-glass Works at New Albany, Ind., will shut down immediately, the skilled employes refusing to withdraw their demand for a 15 per cent. advance in wages. This will throw 500 persons out of employment.

At the car shops of the Missouri Car Wheel Co., are employed 300 men, and a like number at their car shops located at Cambridge City, Ind. The car shops located in St. Louis, while they are controlled by the same company as that operating the Indiana shops, are separate and distinct, the company maintaining two separate shops. The Missouri Car Wheel Foundry is melting about 82 tons of pig metal, 20 tons going into foundry castings, and the rest into car wheels. The car wheel foundry has been enlarged and its capacity increased until it now amounts to 200 car wheels per day. An addition to the foundry casting department has been recently added, greatly increasing its capacity. The castings made are mostly such as are used in the construction of freight cars at their shops. There are employed at this foundry 175 men, of whom 45 are molders in the foundry department.

The Nashua Iron & Steel Co., Nashua, N. H., has just shipped to an Ohio river steamer a steel shaft, said to be the largest ever forged in the world. It is 28 feet 6 inches long, 13 inches in diameter, and weighs 10,990 pounds.

The Peck, Stow & Wilcox Co. have just completed a large addition to their foundry at Plantsville (Southington), Conn., and intend to add to their force of foundry-men.

E. E. Miller & Co., Canton, Ohio, makers of the Torrent steam boiler feed pump, are furnishing their pump for all of C. Aultman & Co.'s monitor engines of from ten horse power and upward; also to four other large engine makers in other States. They are in receipt of an order for 200 from a large firm in Wisconsin.

Wm. T. Bate & Son, East Conshohocken, Pa., have just completed their Norristown Insane Asylum boiler job, having finished six of their 100 H.P. Bate's Patent Steam Generators, described in the March, 1879, number of the AMERICAN MACHINIST. Two more were set to work last week on 23d and 24th Streets, in Philadelphia, and they are now making the twenty-third boiler of this kind. So far every one introduced has met with the highest success.

The E. Horton & Son Co., Windsor Locks, Conn., write us: Business with us is on the increase, and at present we are hardly able to fill our orders. Our sales for the past three months have gradually increased, and the month of January was the best for many years. Orders this month are coming in with a rush, and evidently will make larger sales this month than heretofore. The sale of the Sweetland Chuck is immense.

Work at Bradley's car shops, Worcester, Mass., is booming now-a-days, and the orders they have on hand will keep them busy for many weeks to come. They are turning out twelve freight cars per week for the Fitchburg Railroad, on an order for 200. They are also at work on combination passenger and baggage cars for the Galveston, Harrisburg and San Antonio Railroad in Texas, and have, for future work, an order for 100 freight cars for the Eastern Railroad, besides a number of passenger cars for the same road.

The Central Foundry and Machine Shop, Reading, Pa., is full of work at present. Machinery is being made for a number of hat factories. A large planer has just been placed in the machine shop and other improvements have been added. The machine shop has been running about fifteen hours a day during the past month.

The Lawrence Co., Lowell, Mass., will soon put in a 1000-horse-power Corliss engine.

The water works of the town of Plymouth, Mass., have just been furnished with one of the Worthington compound condensing duplex pumping engines, with a capacity of 60,000 gallons per hour. This was put in operation three weeks ago and is now furnishing the town with an ample quantity of water, and completely supplies the deficiency occasioned by the extra drain upon the works, resultant upon the starting up of the new Sawyer Woolen Mills.

The Lowell Machine Shop, of Lowell, Mass., will this spring enlarge their foundry so as to employ 25 more men.

The Crescent Steel Works, Pittsburgh, Pa., are building a large two-story brick addition to their wareroom. The extention is 60 feet long and 34 feet wide.

The Hartford Foundry and Machine Company, in accordance with a vote of the stockholders, is still undergoing the process of being wound up. This company was organized as a joint stock concern in 1872, with a capital of $72,000, with every prospect of enjoying a prosperous career; but the storm of 1873, that wrecked so many manufacturing establishments, crippled the young company, and the years of depression following made it impracticable to continue business. They are now selling off the machinery, stock and tools. The largest and most valuable pieces of machinery have not been sold, and for the credit of Hartford it is to be hoped they will not be allowed to go elsewhere. Hartford capital should secure them and let them remain in the buildings where they now are until, in the good time coming, the old Woodruff & Beach works shall once more resound with the busy hum of industry.—*Hartford Daily Times.*

Messrs. Tangye Brothers, of the Cornwall Works, Soho, Birmingham, says the *Ironmonger* have just finished one of two 20-horse power hauling engines for the Australian Agricultural Company, Newcastle, New South Wales. These engines are excellent specimens of engineering skill; and, whilst they sustain the reputation of the celebrated firm who produce them, they also serve to illustrate the growth and the progress of an important branch of Birmingham industry. They will be used for hauling coal wagons and "tubs" containing coal along an underground incline, 3,000 yards long; and as they are adapted for mining purposes in Adelaide, will render almost unnecessary the use of animal power in the pits. The engines have been constructed in accordance with an outline of specifications made by Mr. John Fowler, of London.

One hundred new locomotives for the Belgian State Railways will, it is stated, shortly be submitted for competition.

If Concord, N. H., capitalists will take $250,000 worth of stock in the proposed new mills at Garvin's Falls, the Amoskeag, of Manchester, who own the land, will build a mill similar to the new Amory at Manchester. The local water reserve is about 10,000,000 gallons.—*Boston Journal of Commerce.*

The new company which purchased the iron and steel works property at Ironton, O., recently, for $101,000, will be known as the New York and Ohio Iron and Steel Company. They have gone to work vigorously to put both mill and furnace in operation. The mill, hot blasts, engines, boilers, etc., are being rapidly put in order.

South Amboy (N. J.) is soon to have an iron works erected, in which 100 to 150 hands are to be employed. The citizens have raised $10,000 to loan the company, payable in five years, and bearing six per cent. interest.

The Western File Co., Beaver Falls, Pa., shipped eight tons of files to one firm in a single day, lately.

A stock company formed at Canal Dover, Ohio, and duly incorporated one year ago, styled "The Ohio Coal Mining Auger Company," possesses one of the most wonderful tools ever invented, viz., a patent auger for boring coal to blast. This tool will bore seven to ten feet in solid coal, with ease to the miner, in fifteen or twenty minutes time, and without the least danger of breaking any part of the tool. The auger proper is made of malleable iron, while that part which cuts the coal consists of one small knife and a center point, made of very hard steel, and which are both detachable from the auger at the pleasure of the miner and in a second's time.—*Coal Trade Journal.*

The Consolidated Safety Valve Co., Boston, have just received an order for 100 brass lock-up "pop" safety valves from the well-known house of G. Westinghouse & Co., Schenectady, N. Y. Last year this firm used another valve, and this year after investigating the rights of another company and the "Consolidated" came to the latter and placed the orders. They have also just received orders for 25 and 50 valves from two other firms who used valves of another concern last year.

Amongst the noticeable changes being made at the Crane Iron Works, this place, says the Catasauqua, Pa., *Dispatch*, is the tearing away of Nos. 1, 2 and 3 furnaces, to make room for two enlarged furnaces. No. 3 is already demolished, and the rebuilding progressing so rapidly.

The firm of William G. Pennypacker & Co. Wilmington, Del., will rebuild their burned mills; and it is their intention to have them completed as soon as possible, probably of brick, 87x100 feet. The machinery to be used will be of a new pattern having water with turbine wheel as a motor. The capacity will be double that of the old mills.

A machine for making paper boxes, just introduced at Cleveland, Ohio, produces 15,000 complete boxes in a day.

The Holly system of water works is fast approaching completion in Troy. The work has employd 300 men for eight months, and cost $249,500 in all. The capacity of the pumping machinery is 6,000,000 gallons per day, while the maximum quantity used in the city is not over 5,000,000.

The Corliss Steam Engine Works, Providence, are now working to the full extent of their capacity, and have, among the many orders in hand, the following for early delivery: Assabet Manufacturing Co., Maynard, Mass., 150 horse power; Albany and Rensselaer Steel Company, Troy, N. Y., 60 horse power; Narragansett Cotton Mills, Fal River, Mass., two engines, 400 horse power; New York Central railroad shop, Buffalo, N. Y., 200 horse power. They are also making one pair of the two pairs of engines to be used by the city of Boston for pumping the sewerage from Moon Island into the ocean.

Hartupee & Burke, founders and machinists, Pittsburgh, Pa., are overflowing with orders just now. They contemplate greatly enlarging their establishment.

Machinists' and Engineers' Supplies.

NEW YORK, Feb. 13, 1880.

The market in this line is more easy this week, and nearly all the prices on supplies remain unchanged.

The manufacturers of the Root Blowers, S. S. Townsend, Agent, 6 Courtlandt St., N. Y., for machinists and blacksmiths, have a catalogue of their new patterns of blowers in preparation, which will be issued soon.

It is still very difficult to fill orders, and quite impossible to get any stock on hand, notwithstanding most of the manufacturers are working over-time.

Poole & Hunt, Baltimore, Md., have issued a neat annual for 1880, containing calendars and illustrations of their turbine water-wheels, mill gearing and machinery.

We have just received a neat new 38-page supplemental catalogue from the Cope & Maxwell Mfg. Co., Hamilton, Ohio., illustrating some of their new and improved steam pumps. It contains also descriptions and price list.

As we predicted some weeks ago, chucks are being advanced in price. The E. Horton & Son Co., Windsor Locks, Conn., have issued the following notice:

FEB. 1, 1880.

From this date a discount of 25% will be made from the price of the Horton Lathe Chuck, and a discount of 10% from the list price of the Sweetland Improved Horton Chuck. THE E. HORTON & SON CO.

The discount was formerly 30% and 15%.

By mistake we lately referred to Heald, Sisco & Co. as located at Seneca Falls. Their address is Baldwinsville, N. Y.

We have received a copy of the new chuck price-list of A. F. Cushman, Hartford, Conn., and make the following extracts:

DRILL CHUCKS.

Climax Drill Chuck (New), 0 to ⅜	$6.00
Boss Drill Chuck	6.00
No. 7 Key Drill Chuck	8.00
No. 7 Key Drill Chuck, two sets of jaws	10.00
Patent Plug Arbors for all Drill Chucks	1.00

PATENT 3 PINION GEARED CHUCKS

3 in., $11.00	4 in., $13.00	5 in. $15.50
6 in., 18.50	9 in., 23.00	12 in. 30 00

Add 10 per cent. to above lists for Chucks having 4 Jaws. Also, add 20 per cent. for Chucks with two sets of Jaws.

LEVER SCROLL CHUCKS.

3 in., including Screws and Levers	$8.00
4 in., including Screws and Levers	10.00
6 in., including Screws	16,00
9 in., including Bolts	21.00
12 in., including Bolts	26.00
5 in., including Bolts	32.00
18 in., including Bolts	38.00
21 in , including Bolts	48.00
24 in., including Bolts	60.00

Add 10 per cent. to above lists for Chucks having 4 Jaws. Also, add 20 per cent. for Chucks with two sets of Jaws.

IMPROVED LEVER SCROLL CHUCKS.
With Set Screws in the Horn of Jaws.

9 in., $22.00	12 in., $28.00	15 in., $34.00
18 in., 40.00	21 in., 50.00	24 in., 62 00

INDEPENDENT 4 JAWED CHUCKS.
Improved in 1880.

6 in., $20.00	9 in., $25.00	12 in., $30.00
15 in., 35.00	18 in., 45.00	20 in., 50.00
21 in., 55.00	24 in., 65.00	

Above prices include Keys, Bolts, Screws, etc., and all goods are well boxed and delivered free on board.

Iron Review.

NEW YORK, Feb. 13, 1880.

The market this week is firm and shows no element of weakening. The mills do not seem to clear off their orders, as they are not in the market for more contracts. Everything in this line seems to be moving along nicely.

The upward tendency of prices, predicted last week, has culminated in the following quotations out of store, which are furnished us by Pierson & Co., 24 Broadway, N. Y., under date of Feb. 13th, 1880:

No. 1, X Pig, $42½ per ton; Iron Rails, $68 to $70, according to weight; Old Rails $44 to $45; Fish Plates, 4c. per lb.; Railway Spikes, 4¼c.; Bolts and Nuts, 5½c.; Common Bar Iron, 3 7-10c., basis from store; Refined, 4c., basis; Ulster, 5c., basis; Machinery Steel, 7c.; Best Tool Steel, 13½c., Norway Bar Iron, 6¼c.; Norway Shapes, 6¾c.; Nail Rods, 7c.; Sheet Iron, 5c., basis; Angle Iron, 4 3-10c.; Tee Iron, 4 8-10c; Band Iron, 4 7-10c.; Hoop Iron, 4 8-10c. and up according to size; Horse Shoe Iron, 4 7-10c.; Hot Polished Shafting in lengths, 2 ft. and longer, 9 to 10½c., according to size; Small Black Rivets 30% off in papers, 10% off in bulk.

Store prices to-day of boiler-makers supplies: Flange, 6¼c.; C. H. No. 1 Shell, 5¼c., C. No. 1, 4¾c.; Sheets, 5c. basis.

Metal Review.

LUCIUS HART & CO., 8 & 10 Burling slip, New York, furnish us the following, under date of Feb. 12, 1880:

Business, aside from jobbing, is still comparatively quiet in metals. A strong undertone, however, pervades the market. Pig Tin in London is "feverish," and the "Bears" have about exhausted their strength. Since our last, price has declined to £93. Now £97. Singapore, $30.25 per picul. We quote: Banca Tin, 26c.; Straits and Malacca, 23¾ to 24c. as to lots; Australian and Billiton, 23¾c.; English Refined, 23½c. for arrivals; "Lamb and Flag," 23¼ to 23½c.; Bar Tin, 24 to 24¾c., as to quality. Pig Lead, 6⅛ to 6⅛c.; Antimony, strong at 21 to 23c, as to brands; Spelter, 6¾c., Silesian or domestic. Ingot Copper, 24¼ to 24¾c.; Nickel, $1.25; No. 1 Solder, 13¼c.; "Half-and-half," 15½c.

Situations Wanted—Help Wanted.

We will publish notices suitable for the above headings, applying to any of the machinery trades, and not to exceed four lines each (32 words), at the nominal rate of twenty-five cents for each insertion.

An experienced practical Mechanical Engineer and Draughtsman, competent to design general or special machinery in the best manner, desires an engagement. Address J. J. H., AMERICAN MACHINIST office, 96 Fulton street, New York.

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Situation wanted by an experienced Practical Draughtsman and Designer on Tools and Special Machinery. Would take charge of an establishment First-class references. Address B. F. J., care AMERICAN MACHINIST, 96 Fulton Street.

TO ENGINE BUILDERS &c. A strictly first-class man, well up in all modern steam economy, will be open, by the 1st of March, for an engagement, as Superintendent or manager. Middle or Southern states preferred. Address, J. W., care American Machinist, 96 Fulton St., N. Y.

A competent man, who has been machinist, engineer, and master mechanic, wants a position as master mechanic or superintendent of machinery. Best references. Address, A. V., care AMERICAN MACHINIST, 96 Fulton St., New York.

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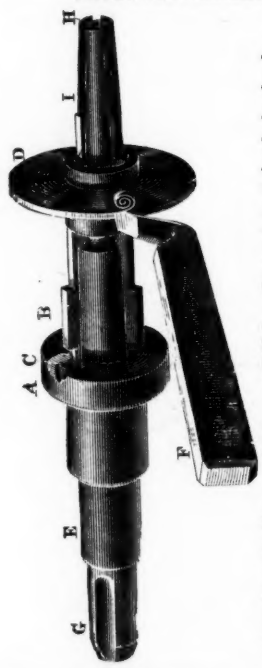

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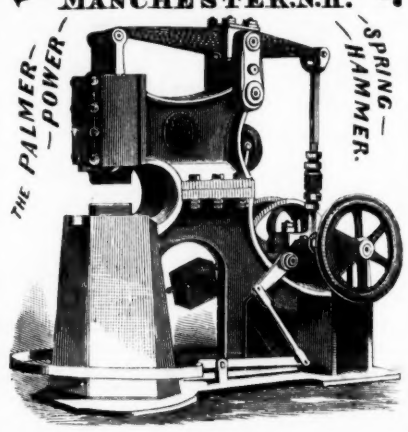

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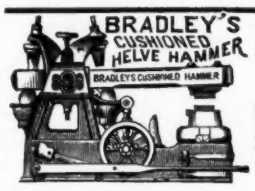

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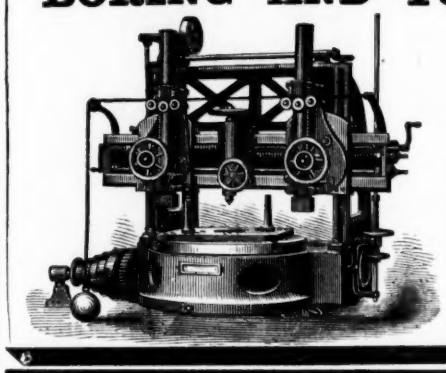

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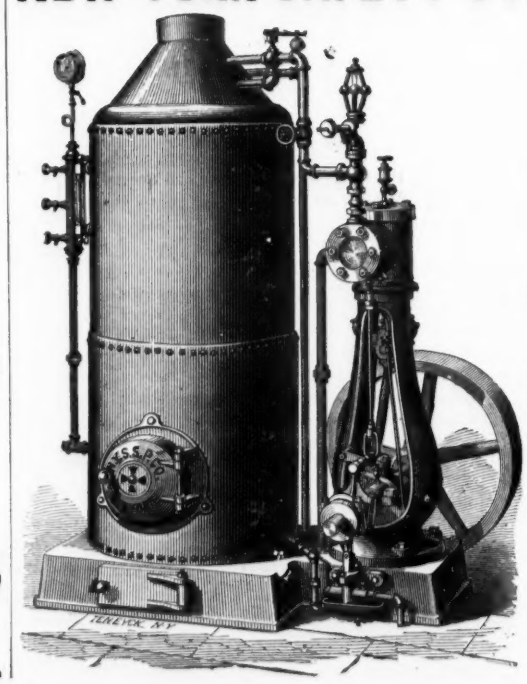

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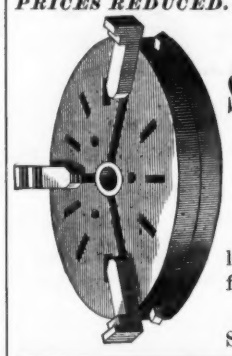

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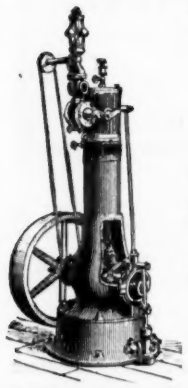

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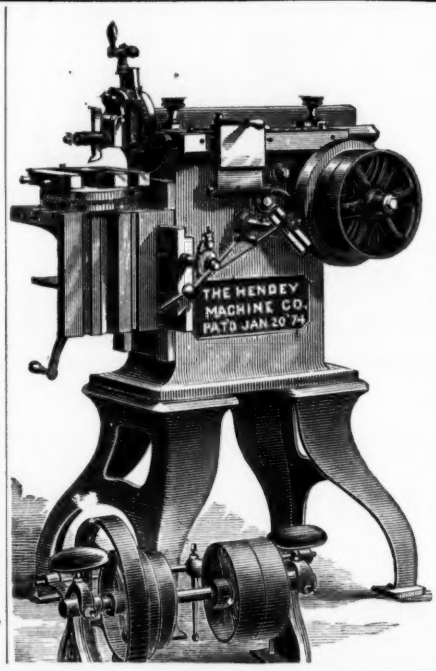

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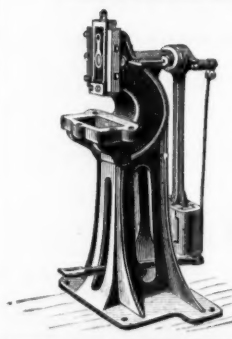

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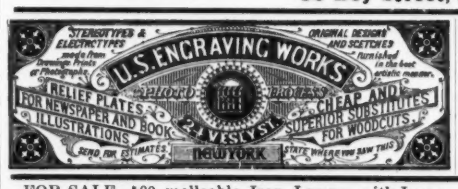
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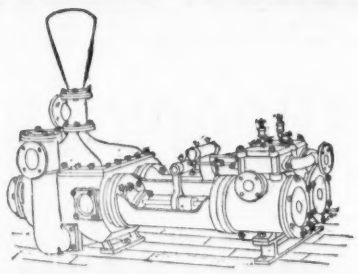

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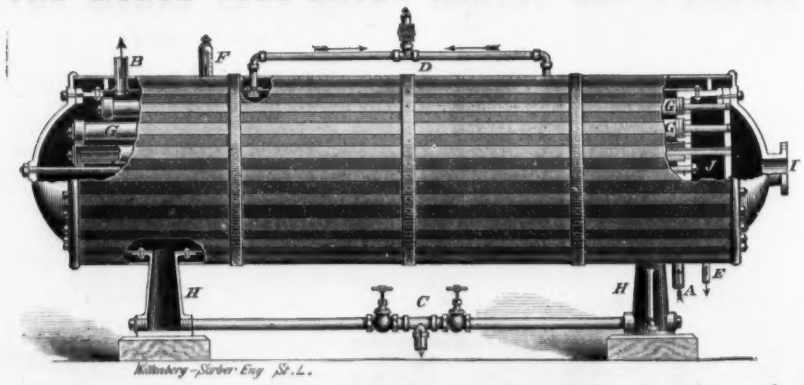

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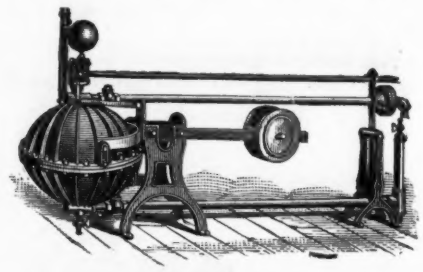

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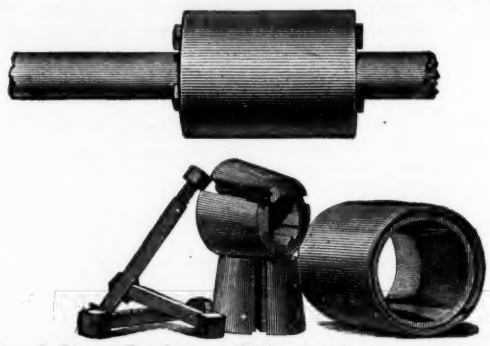

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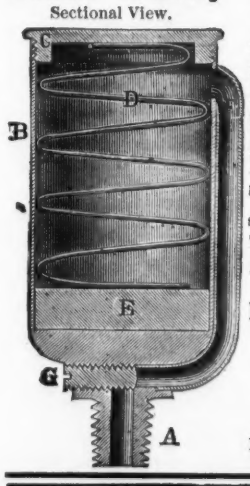

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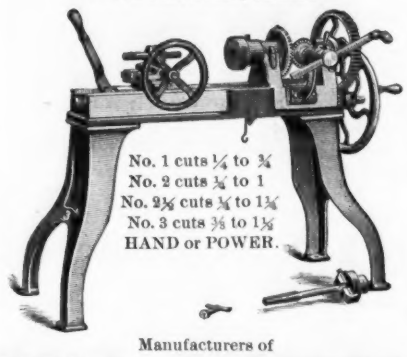

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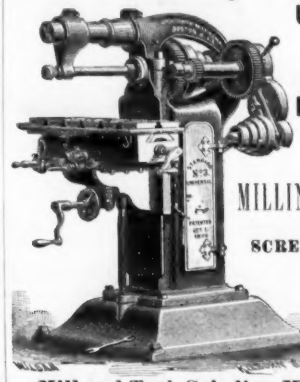

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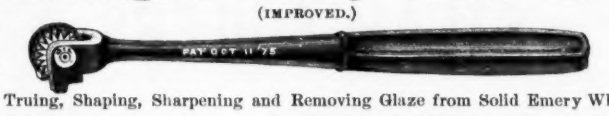

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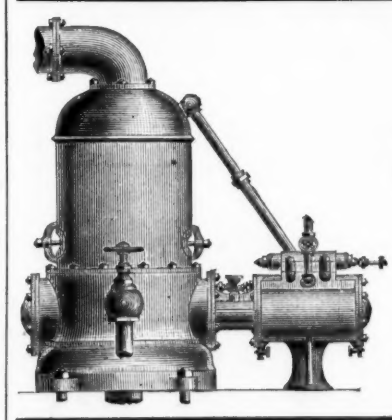

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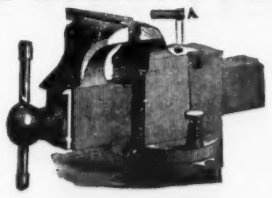

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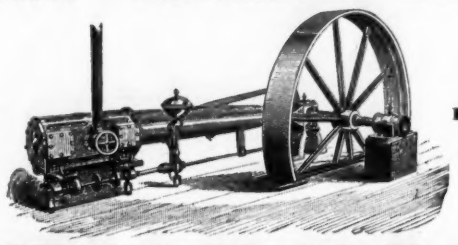

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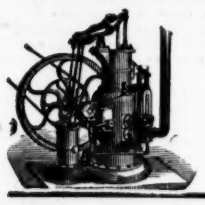

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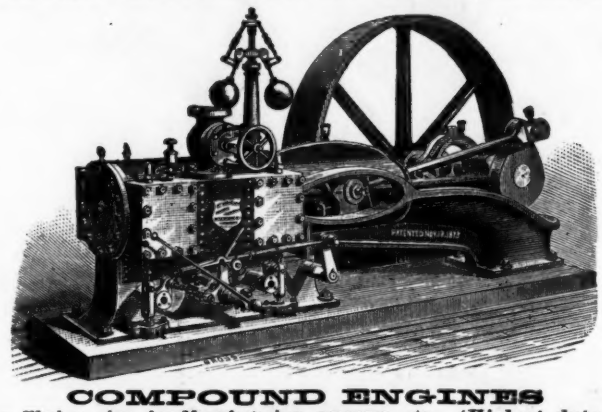

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[We desire to call particular attention to the above letter, as since it was received by us, Lieut. Mahan has confirmed his good opinion of our Engines therein expressed, by ordering two more of them.]

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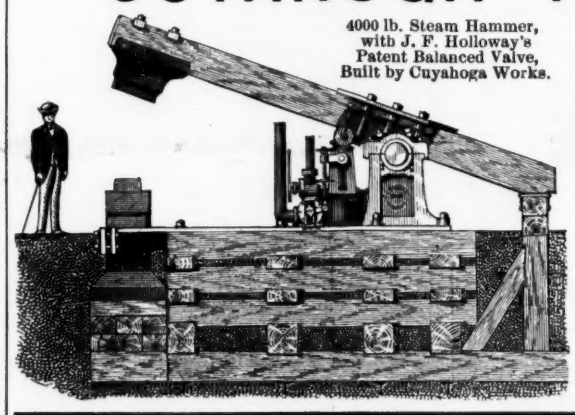

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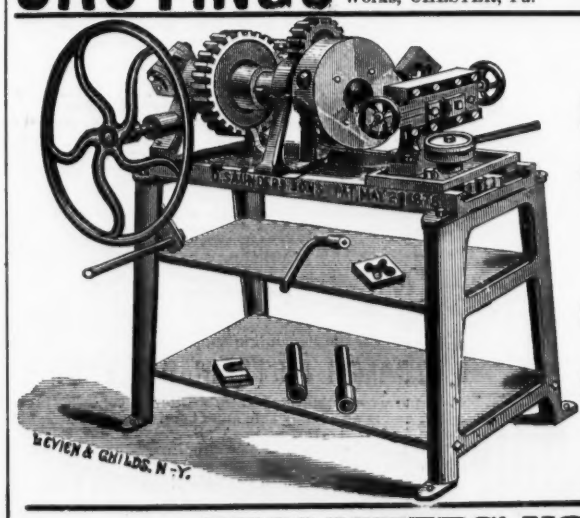

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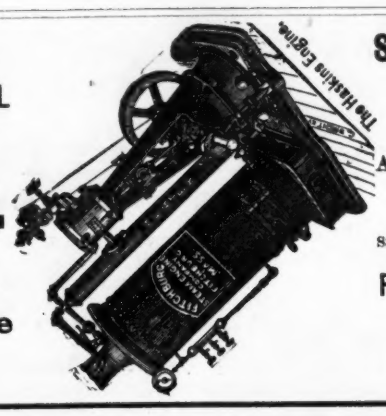

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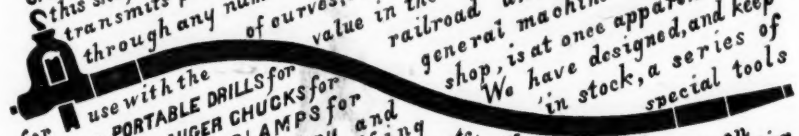
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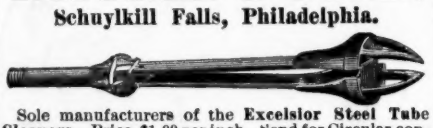

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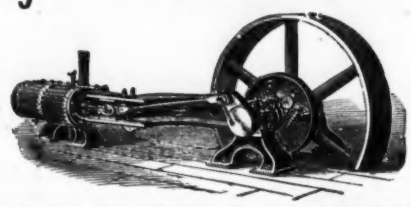

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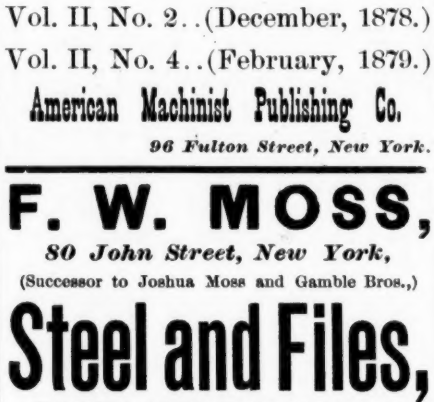

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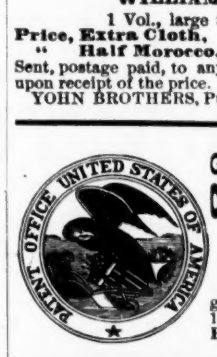

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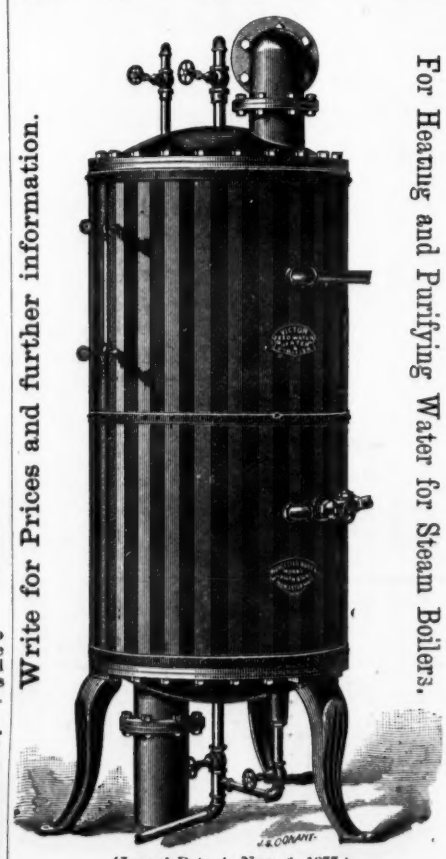

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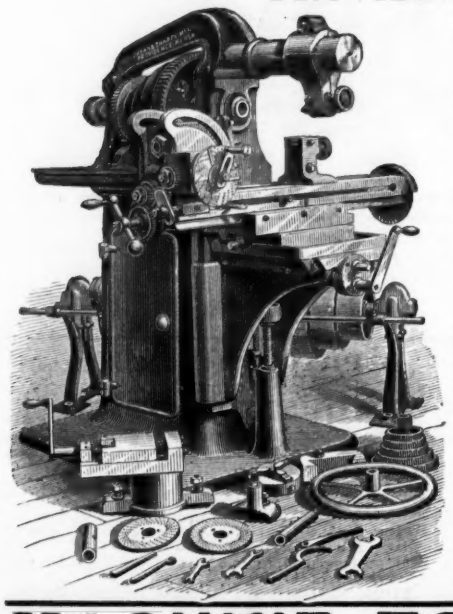

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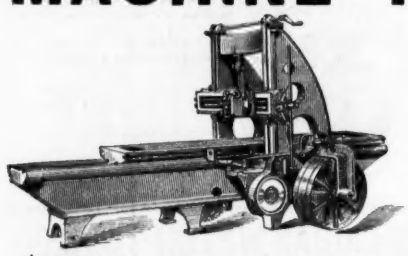

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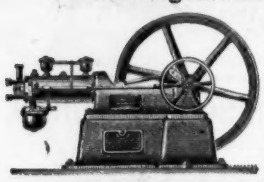

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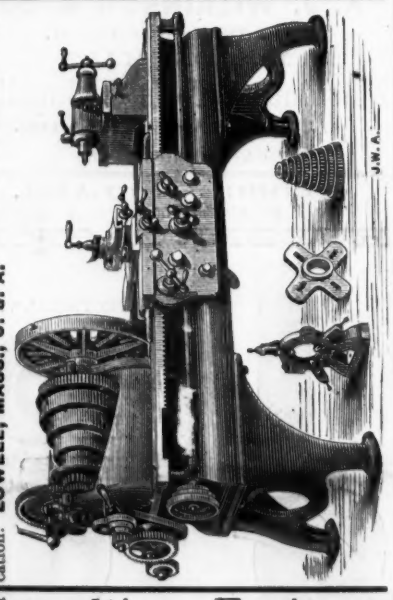

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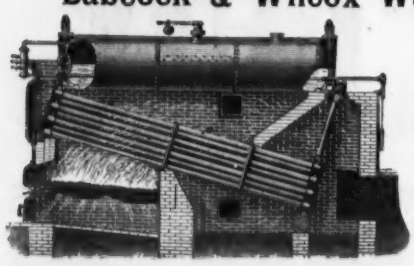

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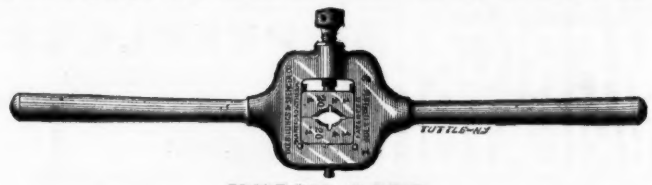

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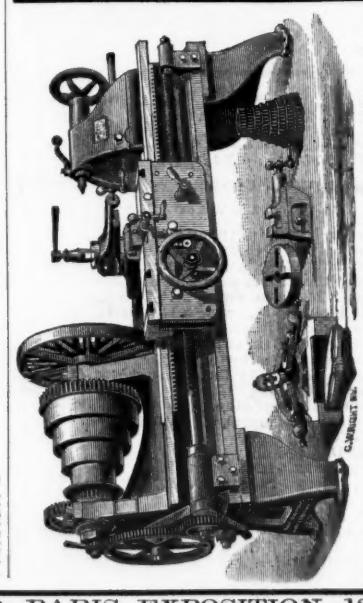

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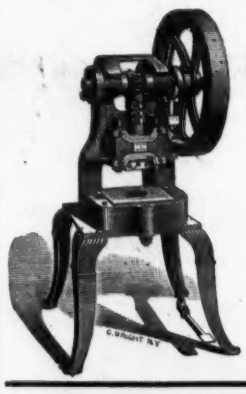

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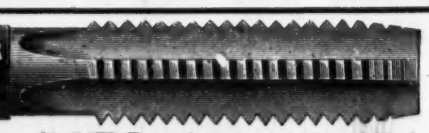

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